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EMERITUS PHYSICIAN, ST. GEORGE'S HOSPITAL; PRESIDENT OF THE ROYAL SOCIETY OF MEDICINE; TEMPORARY SURGEON-REAR-ADMIRAL, R.N.

LECTURE III.*

MORTALITY AND PROGNOSIS.

MR. PRESIDENT, CENSORS, AND FELLOWS OF THE COLLEGE,—In considering the prognosis it is important to have some idea of the natural history of the disease when unmodified by serum treatment. Its severity varies in different epidemics and at different periods of the same epidemic; thus it is generally believed that fulminating cases are more frequent at the beginning and mild and abortive cases towards the end of an epidemic.

From a review of 41 epidemics Hirsch in 1866 found that the mortality varied from 20 to 75 per cent., and according to Rollet the average mortality of epidemics in France up to 1844 was 51 per cent., the extremes being 28 and 75 per cent. Flexner [26] gives statistics of 18 epidemics before the serum era showing death-rates between 90 and 42·5 per cent.; of these 18 epidemics one had a death-rate of 90 per cent., two of 80 per cent., nine of 70 per cent. or more, three of more than 60 per cent., and one of 42·5 per cent. Flexner also compares the death-rates of cases in the same epidemic treated with and without serum showing a very great difference, 30, 40, or even 50 per cent., in favour of those treated with serum. Experience in the Navy also bears witness to the beneficial influence of serum:

Among 96 cases not treated by serum 49, or 51 per cent., proved fatal and out of 105 cases treated in 1915 with serums which appeared to be inert 64, or 61 per cent., were fatal; whereas out of 295 cases treated with serum during the second, third, and fourth years of the war the mortality was 95, or 32·7 per cent.; 176 of these cases receiving Flexner's serum alone with a mortality of 51, or 29 per cent. In Belfast the mortality fell immediately from 72 to 30 per cent. on the introduction of Flexner's serum (Robb).

In quite recent years the mortality has been much higher in this country than would be expected on the assumption that serum treatment is available for all; thus Reece found that among 5306 cases in England and Wales during the years 1914 to 1917 inclusive there were 3471, or 65·4 per cent., deaths. This is more than double the percentage (30·9) of deaths among Flexner's 1294 cases treated by serum, and probably many of the British cases were untreated, or if treated with serum at all not efficiently. By intensive treatment—namely, the intrathecal injection of 60 c.cm. within the first 24 hours, or in bad cases within 12 hours—Welsh and Brown [44] had two deaths only, or 7 per cent., among 28 cases.

Essential Factors in Serum Treatment.

The effect of serum has been shown to depend to a very considerable extent on its early use; thus Flexner found that among 199 cases in which treatment began within three days of the onset the mortality was 18 per cent.; among 346 in which treatment began after the third and before the seventh day 27 per cent., and among 666 cases in which treatment began after the seventh day 36·5 per cent. proved fatal. Netter, Dopter, Christomanos, Levy, and Flack give similar evidence. When dealing with smaller numbers of cases the mortality may not fall regularly with the delay of treatment, because the fulminating cases swell the death-rate on the earlier days, and the mild cases that are atypical and probably would recover under almost any conditions come under treatment late. In a series of 25 cases which were not given serum before the 20th day of the disease Netter [57] obtained cures in 16, or 64 per cent.

It is particularly in the septicæmic or pre-meningitic stage that early and vigorous intravenous administration of serum may cut short the disease. Herrick [41] has recently shown that the free administration of serum intravenously reduced the mortality to 18·5 per cent. from 62·5 per cent. obtained in severe cases treated either by intrathecal injection alone or by intrathecal injection combined with small amounts of serum intravenously.

Another important factor in the serum treatment is that the serum should contain the antibodies specific to the infecting strain of the meningococci. This has been insisted on widely, especially by Dopter, Netter, and Gordon. Flexner's serum from the Rockefeller Institute, which is multivalent and made by the use of 40 strains of meningococci, has on the whole given better results than any other serum; but the use of a multivalent serum, or of a pooled serum of the more probable infecting strains, until the actual type of the infecting organism is determined, when the univalent type serum is substituted, is the ideal plan.

Gordon and Hine [38] have recently published the results of the first 90 cases treated with monotypical serums made by Stanley Griffith at Cambridge in the University Field Laboratories under the direction of the Medical Research Committee. Monotypical serums have been prepared for Types I., II., III., IV., and are known as M.R.C. serum. When a case is first seen and until the type of the infecting meningococcus has been determined, injections of pooled Types I. and II. serums are given; the reasons for not giving pooled serum of all four types are: (*a*) that if this were done, as might logically be suggested, the anti-endotoxin against the existing type would be more dilute than in the pooled serums of Types I. and II.; and (*b*) that from 80 to 85 per cent. of all cases of cerebro-spinal fever are due to infection with meningococci of Types I. or II. When the type is determined the corresponding serum is given.

Out of the 90 cases 7 were fatal solely or largely from causes other than cerebro-spinal fever, and so may be eliminated. Out of the 83 cases 34 were due to Type I. with one death, or 3 per cent.; 32 due to Type II. with 7 deaths, or 21·9 per cent.; 10 to Type III. with no death; and 7 to unknown types with 2 deaths, or 28·6 per cent. Therefore, out of the 83 cases 10 only, or 12 per cent., proved fatal.

The reason why the univalent serum for Type II. is the least successful of the monotypical serums is, as laboratory experiments show, that it contains less anti-endotoxin for the homologous meningococcus than the other serums do; this is because the Type II. meningococcus, as shown by the absorption test, is more complex than the other types. Possibly a more successful serum will be obtained by immunising horses, each against a chief sub-group of Type II. meningococcus and then pooling their serums. I have recently observed a limited outbreak of 10 cases all due to Type II., which, though vigorously treated with Type II. serum, both intravenously and intrathecally by Captain E. H. Shaw, did not react in a satisfactory manner.

Effects of Serum Treatment.

By comparison of the duration of the disease in various series of cases in the pre-serum era with 830 serum-treated cases that recovered Flexner finds that as the result of serum the period of active symptoms is shortened and the cessation of symptoms, which in the natural history of the disease is almost always by lysis, is by crisis in 30 per cent. of the cases. The effect of treatment on prognosis may also be estimated by the sequels of the disease in cases treated by the symptomatic and by specific (serum) methods. Complications appear to be less frequent since the era of serum. In the pre-serum epoch the incidence of internal ear disease varied from 12 to 33 per cent., whereas among Flexner's 1294 cases treated with serum it was 3·5 per cent.; and similarly the incidence of irido-cyclitis fell from between 4 and 10 per cent. of all cases to 1 per cent. Flexner also quotes Longo's small comparative series of cases in children showing the influence of serum in preventing hydrocephalus, deafness, or mental defects.

The factor in serum treatment that is of essential importance in bringing about a rapid and permanent cure is the early and sufficient use of a serum containing the antibodies specific to the type of infecting meningococci so as to abolish the infection, neutralise the toxæmia, and stop the meningitis before adhesions and blocking of the cerebral ventricles are brought about. Death in the early stages may be due to septicæmia and overwhelming toxæmia, which can only be antagonised by the rapid introduction of serum intravenously; the chronic cases are generally due to loculated meningitis and closure of the foramina of the

* Lectures I. and II. were published in THE LANCET of April 5th and 12th, 1919.

cerebral ventricles, and even with operative measures to relieve this sequel of unsuccessful early treatment by serum the outlook is very grave. Some of the chronic or subacute cases are due to meningococcic septicæmia and the prognosis is good provided the condition is recognised and serum given intravenously.

From what has been said it follows that, although the infectivity of the disease is low and a small proportion only of the population is affected, the prognosis of cases untreated by serum is bad, that the death-rate may vary in different epidemics from 20 up to 90 per cent., and is very rarely less than 50 per cent.; whereas with serum treatment the mortality should not be above 30 per cent., and, with further improvement of the methods and serum, may be much less, that the duration of attack is shortened, and the incidence of sequels diminished.

Influence of Age and Occupation on Prognosis.

Age has a distinct influence on prognosis which is bad at the two extremes of life. In infants under 12 months of age the mortality is high, mainly because the patients usually come under observation late from the difficulty in arriving at an early diagnosis, for Robb[70] and others have found that with early treatment infants do very well; the delay in cases that survive may lead to the formation of meningitic adhesions and hydrocephalus (posterior basic meningitis). Between the ages of 2 and 10 the outlook becomes very favourable, but after 40 the mortality curve rises, and in old people, in whom the disease is very rare, it may reach 100 per cent. One of the factors militating against recovery in patients over 40 is the existence of arterio-sclerotic renal disease.

Occupation.—In Australia Fairley and Stewart[23] found that the mortality was higher in soldiers than among civilians, and ascribed this to fatigue due to unaccustomed drills. In this country, however, this was not the case, as is shown by the following figures given in the first lecture:—

Years.	Deaths. Civilian population.	Military.
1914	68·7 per cent. ...	60 per cent. (from Sept. 19th only).
1915	64·9 ,, ...	49 ,,
1916	65·6 ,, ...	44·5 ,,
1917	65·4 ,, ...	44·3 ,,

Individual Symptoms in Regard to Prognosis.

The prognostic significance of individual symptoms may be considered first as regards those due to the general systemic invasion. A very acute onset with sudden loss of consciousness—the *apoplectiform onset*—has a serious outlook, as death may rapidly follow, but if the acute stage does not prove fatal recovery may eventually occur.

Among 247 cases of cerebro spinal fever in the Navy during the second and third years of the war this apoplectic onset occurred in 12, or 5 per cent., and 6 proved fatal.

As the *fulminating* cases with large purpuric areas and a high mortality may also show cyanosis and dyspnœa, these signs are very grave prognostics; sweating is often associating with the cyanosis and dyspnœa, but alone has not the same sinister significance. The presence of a *rash* without further qualification does not affect the prognosis to any considerable degree, but a distinction must be made in this respect between the hæmorrhagic rashes, and more especially large purpuric extravasations on the one hand and the non-hæmorrhagic rashes on the other.

Among 502 naval cases 296 had rashes of some kind or another, with a mortality of 129, or 43·5 per cent., whereas of the remaining 206 cases without recorded rashes 80, or 39 per cent., proved fatal. But out of 153 cases with hæmorrhagic rashes 65, or 42·5 per cent., proved fatal, whereas out of 42 non-hæmorrhagic eruptions the mortality was 12, or 28·6 per cent. The 153 cases with hæmorrhagic rashes include both the large purpuric rashes and the petechial, and of these the former have, of course, much the graver prognostic importance.

Although it has been stated that, as in pneumonia, a low *leucocyte count* is a bad sign,[36] it is generally agreed that no prognosis as to a fatal result can be made from the leucocyte count. Similarly the *temperature* and the degree of *headache* have little, if any, ultimate prognostic significance.

As herpes labialis usually appears on the fourth day of the disease it is hardly ever seen in the fulminating cases that prove fatal within 48 hours of the onset. The good prognosis formerly ascribed to *herpes*, and to a *serum rash*, probably depends on the occurrence of death in a considerable number of the severe cases before the time for appearance of the rashes is due. Thus, out of 86 fatal cases in the Navy during the third and fourth years of the war 27, or almost a third, occurred before the fourth day of the disease. Cases with a serum rash usually do well, and Ker[46] considers that sharp attacks of serum disease exert a favourable action on the course of the disease, possibly as a result of metabolic stimulation; this view is confirmed by Longcope and Rackemann's[49] demonstration that after serum disease antibodies to horse serum begin to appear in the blood, at first slowly and later rapidly.

Synovitis is a metastatic complication which, according to Netter, is seen in cases which eventually are cured. Possibly the local focus acts as a "fixation abscess" and raises the resistance to infection in the same manner as a vaccine. Among 24 cases of synovitis in the Navy the mortality was 6, or 25 per cent., considerably lower than the mortality for the 502 cases. *Pericarditis* is often latent, and though looked for during life may be found only at the necropsy: this occurred in the 1904–05 epidemic in New York, and accordingly Koplik[47] speaks of pericarditis as a fatal sign, but this view is unduly pessimistic. Among the naval cases it was found after death in three instances, and pericardial friction was heard in three cases that recovered.

The bearing of the *arterial blood pressure* on prognosis has been dealt with by Fairley and Stewart, who find that a low blood pressure during the first three days is associated with a severe infection, and is therefore of bad omen. The degree of the rise of blood pressure consequent on the onset of meningitis and increased intracranial pressure is important; among 116 cases with an average blood pressure above 120 mm. Hg after the third day of the disease 70 per cent. proved fatal, whereas among 120 cases with an average blood pressure below 120 mm. Hg the mortality was 21 per cent. Cerebral hæmorrhage may occur as a result of the raised blood pressure.

The occurrence of *ptosis* or *hemiplegia* points to a definite lesion and renders the prognosis grave.

As pointed out above, the mortality among 18 naval cases with ptosis was 13, or 72 per cent.; whereas that of 59 cases with strabismus (probably mainly spasmodic and not paralytic) was 31, or 52·5 per cent. Among 12 naval cases with hemiplegia 10 proved fatal.

On the other hand, *facial paralysis* or *paresis* is an early and transient event and does not cloud the outlook.

From routine examination of 184 patients, 116 of whom had optic neuritis, Fairley and Stewart found that the presence or absence of *optic neuritis* is of no value in prognosis, for out of the 116 cases 74, or 65 per cent., recovered, and the intensity of the changes did not bear any relation to the severity of the disease. *Nystagmus* occurs in grave cases and is regarded by Fairley and Stewart as pathognomonic of internal hydrocephalus. The nature of the *cerebro-spinal fluid* does not form a guide to the outcome of the case, except in so far as a large number of extracellular meningococci make the outlook bad. A purulent fluid may rapidly clear after intrathecal injection of efficient serum or a clear fluid may rapidly become purulent.

The occurrence of *broncho-pneumonia* naturally renders the outlook very serious. Cheyne-Stokes breathing and Biot's cerebral type of *respiration*, characterised by periods of apnœa at irregular intervals, point to approaching death, as does slowing of the respiration pulse ratio from the normal 1 : 4 to 1 : 2. The respiration may fail entirely while the pulse is well maintained. According to Fairley and Stewart there is no definite relation between the respiratory rate and the intrathecal pressure as estimated by Quincke's manometer.

Finally, the prognosis is fallacious and difficult, as sudden exacerbations from reinfection may occur most unexpectedly.

Remote Prognosis.

Cerebro-spinal fever is a killing rather than a crippling disease. In the past it had a bad reputation for the number of disabilities—mental, nervous, and auditory, which in young children accounted for much deaf-mutism—left behind. But at the present time there is a general agreement that if the patient survive he is not likely, apart, perhaps, from deafness, to be permanently crippled. As already mentioned, Flexner's figures show that the incidence of complications and sequels is much diminished by serum

treatment. But it is not certain that the general rarity of severe after-results is entirely due to the introduction of serum treatment; for even now a number of cases do not receive efficient serum treatment, and in 1915 the serum available in this country appeared to be inert, and yet there was no noticeable crop of disabilities. Foster and Gaskell,[33] who relied mainly on lumbar puncture in that year, noted very few sequels in their cases, and explained the greater frequency of disabilities in the past, when lumbar puncture was not in vogue, to the effects of continued increased intracranial pressure.

Mental changes do not appear to be much more frequent than after other severe diseases. During convalescence there may be some mental debility and occasionally impaired memory, but no permanent mental defect is left behind. Worster-Drought,[35] from analysis of 120 cases in 1915–17 that recovered, found that in none was there permanent mental defect. In rare instances epilepsy has followed cerebro-spinal fever; Netter[58] has seen five examples of this, but among his 253 cases that recovered this sequel occurred once only. Sainton[76] reported two cases; in one the epilepsy began a month after the disease, in the other after an interval of six months; he ascribes it to the persistence of some meningeal irritation, and Netter points out that this may be anticipated in cases with hemiplegia or partial convulsions during the acute disease.

Paralyses of various forms, apart from the ocular manifestations during the acute stage of the disease, are rare and are very seldom permanent. It is highly probable, as pointed out by Netter and Debré,[61] that many of the permanent paralyses formerly ascribed to cerebro-spinal fever were due to acute polioencephalitis, the meningitic form of which may so closely imitate meningococcic meningitis. According to Sophian, most of the paralyses in cerebro-spinal fever are cerebral in origin, and this raises the question of the diagnosis from acute polioencephalitis in those instances in which the diagnosis of meningococcic infection has not been proved bacteriologically.

Day of Death.

More than half the fatal cases occur during the first week of the disease.

Out of 86 deaths among 225 naval cases during the third and fourth years of the war 17 occurred within the first two days or were fulminating cases, eight on the third, and 12 on the fourth day, so that 37, or 42 per cent., of the deaths occurred within the first four days. Three deaths occurred on the fifth, 5 on the sixth, and 2 on the seventh day, so that 47, or more than half the cases, were fatal within the first week. During the second week there were 15 deaths, during the third week 12, during the fourth and fifth weeks 3 each, 2 in the sixth week, 1 in the seventh week, and isolated cases on the 57th, 67th, and 90th days of the disease.

PROPHYLAXIS.

Hygienic Measures.

Good general hygienic conditions are, of course, important in maintaining the resistance of the body to infection and so preventing the occurrence of other diseases favouring meningococcic invasion. Hence, fresh air, efficient ventilation, proper clothing, good food, the avoidance of overfatigue, and protection from depressing conditions are desirable, particularly in the case of recruits, new entries into the Navy, and newcomers to institutions. During epidemics it is desirable, as far as possible, to temper the wind to the raw recruits and to delay vaccination and antityphoid inoculation until they have become accustomed to their new life. After vaccination and inoculation special care should be taken to avoid fatigue from drills and route marches.

As catarrhal diseases, such as influenza, catarrh, tonsillitis, and sore throat, appear to play some part in favouring the outbreak of cerebro-spinal fever, and often precede its appearance and may coincide with its prevalence, every effort to limit their spread should be made. Special care should be taken to prevent the common use of handkerchiefs and towels. Isolation when possible should be carried out, and the cubic space in the rooms may be increased. The throats and noses, both of the unaffected and of the patients, should be sprayed with dichloramine-T or douched with a mild antiseptic lotion, such as warm solution of permanganate of potassium, 1 in 1000. When convalescent the men should be carefully protected from fatigue.

The avoidance of overcrowding is an essential factor in maintaining the general health and, further, in preventing a rise in the rate of meningococcic carriers and the consequent occurrence of cases of the disease. The importance of a sufficient cubic space (600 cubic feet) per individual and of 3 or at the least, as an emergency measure, 2½ feet between the beds when more than one person occupies a room, has been shown by Glover. It was also brought out by events at the naval barracks in the last quarter of 1918; as a result of the severe influenza epidemic in September and October an Admiralty order came out in October to the effect that the hammocks in the naval barracks should be 2½ feet distant at their nearest points and that the men should lie alternately head and feet; during October there were in the Navy 21 cases of cerebro-spinal fever, all but one in barracks or similar establishments, in November there were 6 cases (one in a ship), and in December 2.

Search for Carriers.

As the disease is spread by human carriers it should be exterminated if all the carriers were detected and isolated until they became permanently negative. At present the general public is not educated up to this ideal, and even if it were, the labour entailed by its effective performance would be almost, if not entirely, prohibitive. Further, the frequency of intermittent carriers[3] and the failure of bacteriological tests would prevent such a drastic measure from being infallible.

The question of wholesale examination of naval and military forces for carriers has been much debated, and it is clear that unless the naval and military units when thus cleared from carriers are entirely isolated from the civil population, infection will be continually re-introduced. By the order of Sir Arthur May, Director-General of the Medical Department of the Admiralty, swabs from the throats of new entries into the Navy, and drafts, were examined bacteriologically from the early part of 1916 to the end of December, 1918. Although the number of cases in sea-going ships has fortunately been low—48, or 13 per cent., out of the 360 cases—from the beginning of 1916 to December 31st, 1918, it was higher than in the first seventeen months of the war, during which the routine search for carriers was not carried out and 17 cases, or 8·7 per cent., out of 195 cases in the Navy occurred in sea-going ships.

It therefore appears that the relative freedom of the sea-going ships from the disease depends on factors other than the search for carriers, and among them is probably the more matured condition of the crews, for the disease occurs mainly in new entries in barracks. Flexner,[20] however, from comparison of statistics from camps in which the search for carriers had been carried out with those in which this course was not adopted, considers that the incidence of the disease was lower in the former; and among the New Zealand troops isolation and disinfection of carriers before embarkation for Europe was followed by good results (Parkes).[67] On the other hand, Galambos[31] insists that the segregation and disinfection of healthy carriers are useless, as the incidence of the disease is not influenced thereby, and he quotes other German writers, G. B. Gruber, Klinger, and Fourmann, to the same effect. Gruber considers that meningococcic carriers are on a par as regards their significance with pneumococcic carriers; but this would appear to be on the assumption that isolation of pneumococcic carriers is unthinkable, whereas recent observations on carriers of virulent pneumococci show their importance. Mink[55] from his experience at the Great Lakes Naval Training Station considered the isolation of carriers quite worthless in the prevention of the disease.

Two suggested methods, short of complete search for and segregation and disinfection of all carriers in naval and military forces, may be quoted: (1) that search for carriers should only be made when a case of the disease arises, and only among the contacts, the carriers thus detected being segregated and disinfected; (2) that new entries should be examined and the detected carriers treated in a selective manner. Thus, just as in pneumococcic carriers, so also in the case of meningococcic carriers the saprophytic germs may be of the same or of a different strain from that causing the vast majority of the cases of the disease. Thus 70 to 85 per cent. of all the epidemic cases of cerebro-spinal fever are due to two strains of meningococci; and for the exigencies of the Service it has been suggested that all

carriers should be treated with sprays, but that only those with large numbers of meningococci and meningococci of the epidemic strains should be isolated. These dangerous carriers would be kept isolated until four successive weekly swabs from the naso-pharynx have been shown to be free from meningococci.

Treatment of Carriers.

Fresh air and sunshine are important; the positive carriers should be kept separate from those who have become negative so as to obviate re-infection, and carriers should be isolated according to their types so as to prevent cross infection.

In local treatment of the naso-pharynx by gargles, douches, swabbing, hand-sprays, and inhaling chambers, it is important that mild antiseptics, such as dilute solutions of chloramine-T, dichloramine-T, acriflavine, carbolic acid, carbolised solution of iodine, boracic, permanganate of potassium, sulphate of zinc, formalin, should be employed, otherwise the naso-pharyngeal mucous membrane may be so damaged that the carrier state is prolonged instead of being shortened. Gordon and Hine have supervised the construction of spraying chambers fitted up with Hine's special steam jet. The carriers should be three feet apart in the chamber and turned back to back, and in order to avoid cross infections carriers of the same type should be treated at the same time. The men may with advantage sit down, so as to obviate fainting, and should be told to breathe in through the nose and out through the mouth.

By the local application of dried antimeningococcic serum to the naso-pharynx, by means of a special apparatus provided by the Pasteur Institute, Cayrel[9] cured 23 out of 30 meningococcic carriers in three to five days. A powder composed of dried antimeningococcic serum, arsenobenzol, benzoin, and bismuth carbonate has also been employed in France, the powder being blown into the nostrils four times daily (Derriey).[21] Vaccines have been occasionally used (Chalmers and O'Farrell[11]), but their failure is not unnatural, as the carriers are probably vaccinating themselves as shown by the presence of antibodies in their blood (Gates[25]).

As transient carriers rapidly become negative spontaneously, whereas the cure of chronic carriers is prolonged and difficult, there is some difference of opinion as to the value of antiseptic sprays and other methods in the treatment of carriers.

Among 360 carriers at Portsmouth Fildes and Baker[25] found that 212 were mild carriers with an average duration of 0·45 month, 126 being positive for one week only, and 148 chronic carriers with an average duration of 2·6 months. The chronic carriers were nearly all of the less pathogenic Types II. and IV., the latter being twice as numerous as the former. They also conclude that 33 per cent. of their carriers recovered spontaneously and that about 50 per cent. of those treated by various antiseptic sprays recovered, and that none of the methods had any conspicuous merit, the difference between 50 and 33 per cent. being due not to the efficacy of treatment but to the fact that the figures were calculated from two series of men.

At another naval depôt nine chronic carriers were rapidly cured by chloramine-T in an inhaling chamber. But at camp McClellan Robey[71] found that some carriers cleared up rapidly and that others were unaffected by various sprays four times daily, and concludes that sunshine and warm fresh air were more effective than spraying in clearing the naso-pharynx of meningococci.

Cleminson's[13] work suggests that the resistance of chronic carriers to disinfection may be due to factors in the carriers rather than to inefficacy of the sterilising methods. The accessory sinuses appear to be the chief sites of the saprophytic meningococci, and "firm mucous contact" between the middle turbinals and septum on the one hand, and the outer wall of the nose on the other, obstructs the ostia of the sinuses and so prevents the access of the antiseptic spray to the infected sinuses. To shrink up the mucosa, to dilate the ostia of the sinuses, and so allow free access of the antiseptic, a spray of adrenalin chloride 1 in 6000 saline solution was used before the flavine or other spray, and was followed by improvement in the results. It is also suggested that partial turbinectomy by throwing open the ostia of most of the accessory sinuses might accelerate the cure of chronic carriers; but the results of this procedure, if it has been extensively carried out, are not known. Cleminson finds that other factors rendering chronic carriers resistant to treatment are pyorrhœa alveolaris and pre-existing infection of the sinuses.

Precautions against droplet infection should, of course, be observed by those in attendance on cases of the disease; masks should be worn and the naso-pharynx frequently washed out with a mild antiseptic solution. The throats of nurses and attendants should be periodically swabbed for bacteriological examination.

Preventive Vaccination.

Prophylactic vaccination of the general population by meningococcic vaccine has been carried out when an epidemic outbreak is anticipated. A multivalent meningococcic vaccine was found by Sophian[30] and Black[5] to afford a high degree of protection lasting for 12 months, and after the outbreak of war this prophylactic measure was more extensively tested in England (Greenwood[39]), America (Gates), and in the Sudan (Chalmers and O'Farrell).

Greenwood reports that of 4000 persons inoculated twice at a week's interval, none had the disease, and with the caution of an expert statistician concludes that a prima facie case in favour of prophylactic inoculation has been made out. Among 3700 volunteers inoculated Gates found that three men who had received two or three injections had cerebro-spinal fever; in two of these the injections were probably given during the incubation period of the disease, but the third patient should have been immune when he went sick. Gates demonstrated specific meningococcic immune bodies in the blood serum of the inoculated men as compared with normal controls.

The dosage has varied in the hands of different clinicians: Chalmers and O'Farrell began tentatively with 5 million meningococci and did not get above 100 million; in Greenwood's cases a first injection of 250 to 300 millions was followed a week later by 1000 millions; Sophian and Black gave injections at weekly intervals of 100, 500, and 1000 millions, and Gates employed three injections, also at weekly intervals, of 2000, 4000, and 4000 or 8000 and found that these rarely caused more than the mildest local and general reactions. In exceptional cases with unusual susceptibility to the vaccine severe symptoms of meningism, sometimes suggesting the onset of meningitis, followed; but these manifestations did not last more than a few hours. According to Whitmore, Fennel, and Petersen[35] a multivalent meningococcic lipovaccine—namely, with an oily suspension, as in the T.A.B. lipo-vaccine of Le Moignic—diminishes the risk of a local reaction.

SERUM TREATMENT.

Serum treatment, which, though first employed by Jochmann, is chiefly due to Flexner's exertions, has greatly diminished the severity and mortality of the disease. As this was discussed in the section on prognosis no further figures need be brought forward; but the serum treatment must be efficient, and it is probably due to failures in this respect that the civil mortality (65 per cent.) in this country, as shown by Reece's figures for 1914–17, is so much higher than statistics published from hospitals.

Importance of Specificity of the Serum.

The use of serum is not so simple or so uniformly successful as that of antidiphtheritic serum, which is antitoxic, whereas antimeningococcic serum, possessing bacteriolytic, bacteriotropic (opsonic), and anti-endotoxic properties, is more likely to fail in its powers as a whole. Gordon[37] found that the anti-endotoxin in deficient in a considerable proportion of the samples of antimeningococcic serum supplied for therapeutic use, although they contained a good supply of opsonin, and that the clinical potency of a serum depends on its anti-endotoxic capacity. The existence of different types of meningococci with specific antibodies renders the success of the serum treatment less certain than in the case of antidiphtheritic serum. The widespread failure of the antimeningococcic serums available in 1915 in this country appeared to depend on the absence of antibodies specific to the infecting organisms, and stood out in striking contrast to the results obtained in 1916, when Flexner's multivalent and other serums were available.

The establishment of different types of meningococci and as a corollary the preparation of homologous serums so that a multivalent or pooled serum is given until the type of the infecting organism is determined when the specific univalent type serum is substituted, has already, as shown by Gordon

as Hine's analysis, greatly improved the results of serum treatment. The extreme importance of specificity in the serum treatment of the disease and the absence of any benefit from non-specific treatment, or protein shock therapy, of which an extensive trial has unintentionally been made, are noteworthy.

The important question, indeed, may be raised whether the intrathecal injection of inert serum may not do positive harm. As already mentioned, horse serum sets up an aseptic meningitis and favours the passage of meningococci through the meninges. It might, on the other hand, be argued that the increased number of phagocytes thus provided might do good. But it is significant that in 1915 the mortality among the naval cases treated with serum intrathecally was higher (61 per cent.) than among those treated in other ways (41 per cent.); and in this connexion another series of naval cases in that year may be quoted: among 21 cases treated with soamin alone there were seven deaths, or 33 per cent., whereas among 18 cases that received both soamin and antimeningococcic serum intrathecally there was a mortality of 11, or 61 per cent.

Some Difficulties in Serum Treatment.

The nature of cerebro-spinal fever differs from that of diphtheria, and may be regarded in the first place as a general hæmic infection or invasion which later, but not necessarily, attacks the meninges, whereas diphtheria is, like tetanus, a local infection which produces a toxæmia. As a result of the meningococcæmia, foci of infection, unaffected by intrathecal injection of serum, may persist and cause recrudescences of meningitis. Further, inflammation of the meninges, like that of other serous membranes, is prone to set up adhesions and so produce isolated loculi where the infective process, being out of the reach of the intrathecal injections of serum, continues to cause symptoms. Another result is that the foramina of exit of the cerebral ventricles become obstructed and the ventricles become distended with turbid fluid containing meningococci, or eventually a sterile hydrocephalus results. The persistence of symptoms from a general meningococcæmia or from an encysted infection, especially of the cerebral ventricles, may lead to a prolonged course of intrathecal injections which may cause grave symptoms and from the nature of the case cannot do good; for in these circumstances an intravenous or intra-ventricular injection of serum is required.

As another explanation of the failure of serum treatment it has been suggested that the meningococci may become fast to the serum, but this hypothesis must not be allowed to minimise the importance of giving a serum strictly homologous to the type of the infecting meningococcus.

Another factor rendering the serum treatment difficult is the occurrence of phenomena, variously called sero-toxic meningism or acquired intolerance of the meninges, about the time that the ordinary manifestations of serum disease are due. The symptoms resemble a relapse, but the cerebro-spinal fluid does not show meningococci and does contain sugar. If in these circumstances a fresh injection of serum be given, the patient may manifest severe pain, become delirious, show definite signs of meningitis (*vide infra*), and often goes down hill.

Human Serum.

In addition to the serum of immunised horses, the serum from convalescent patients has often been tried. In 1907 Ivy Mackenzie and Martin [31] treated 16 acute and 4 chronic cases with serum from convalescent patients, the average amount injected intrathecally being 15–20 c.cm., and obtained 10 recoveries among the acute cases (2 receiving their own blood serum). Fairley and Stewart recently modified this procedure by adding 5 c.cm. of blood serum from convalescent patients, proved to have a negative Wassermann reaction, to 20 c.cm. of a potent antimeningococcic serum. The addition of human serum was made with the object of reinforcement of complement. The mortality of the 10 acute cases thus treated was 30 per cent., whereas that of acute cases treated by serum without complement reinforcement was 50 per cent. It is obvious that when blood serum from a convalescent patient is employed for treatment, the type of the infecting meningococcus should be the same in the donor as in the recipient.

SERUM TREATMENT IN VARIOUS FORMS OF THE DISEASE.

The serum treatment of cerebro-spinal fever may be divided into: (I.) That of the general systemic infection before the meninges have been infected, or of the pre-meningitic stage; this is effected by the intravenous injection of antimeningococcic serum. The hypodermic or intramuscular injection of serum has also been advocated, but appears to be less effective for this purpose. (II.) That of meningococcic meningitis by the intrathecal injections of serum. (III.) That of closed meningococcic infections of the central nervous system, for example, of the cerebral ventricles or of foci isolated by adhesions from the intrathecal space, and so out of reach of serum introduced intrathecally after ordinary lumbar puncture. (IV.) That of other foci of meningococcic infection, the joints and the eye, by the local injection of serum. This category is insignificant in importance to the others.

(I.) *Serum Treatment of the Pre-meningitic Stage by Intravenous Injection.*

Comparatively recently it has been more generally realised that in the earliest stage of cerebro-spinal fever there is a blood invasion or septicæmia, and that this is usually, but not invariably followed by meningeal infection, and as a corollary that in this pre-meningitic stage the proper course is to introduce the antimeningococcic serum into the blood stream.

In addition it appears that the intrathecal injection of serum before the meningococci have invaded the meninges is not a harmless procedure. Austrian [1] proved experimentally that meningococci injected into the blood stream do not pass through the meninges and set up meningitis; this is prevented by the barrier set up by the meningeal-choroidal complex, and recalls Sherrington's [78] observation that healthy secreting membranes are not pervious to the bacteria. But Flexner and Amoss,[29] as well as Austrian, have shown that the defence of the meningeal-choroidal complex is broken down by injury, as can be done by the intrathecal injection of horse serum with resulting aseptic meningitis. The premature intrathecal injection of serum—namely, before the meninges have allowed meningococci to pass through, may thus determine meningitis.

The most efficacious method of introducing the serum into the blood stream is obviously by intravenous injection, and from experience of more than 100 patients thus treated Herrick [42] finds that it is both satisfactory and safe. His treatment aims at the sterilisation of the blood before the meninges have become affected and is an advance on the usual methods which are concentrated upon the later stage when meningitis is established. Large quantities (200–600 c.cm. in all) of serum are given intravenously and, when there is meningitis present, active spinal drainage and comparatively small intrathecal injections of serum are carried out. No bad effects followed the large intravenous injections and serious anaphylaxis was seen in only one case. Goldon [36] found that intravenous injections of 20 to 40 c.cm. were usually followed by more or less shock, with failure of the pulse and respiration, lasting about 15 minutes, and followed by a rigor and a rise of 2° to 4° of temperature.

Of the four classes of cases—the abortive, the ordinary, the severe, and the fulminating—Herrick's most brilliant results were obtained in the severe cases, the patients often coming out of coma with rapid recession of the rash and symptoms so that in 48 hours many are apparently out of danger; large intravenous injections reduced the mortality of the severe cases from 64 to 19 per cent. Subacute and chronic cases with cachexia, delirium, and other distressing symptoms are seldom seen, the course of the disease is shortened and the incidence of complications diminished. Out of Herrick's 265 cases 64, or 25 per cent., proved fatal, but out of 137 given ordinary intrathecal injections and less than 45 c.cm. intravenously 47, or 34 per cent., proved fatal, whereas out of 128 treated intrathecally with small doses and intravenously with large doses (50 to 800 c.cm. in all) of serum 19, or 15 per cent., proved fatal. In mild cases good results followed either of these forms of treatment. Goldon usually found that one intravenous injection was sufficient, and then, if meningitis was present, gave intensive intrathecal injections; out of 138 cases 29, or 21 per cent., proved fatal, but 16 of these were admitted in an unconscious state with a purpuric rash.

Some French physicians, such as Netter,[59] Sainton,[77] and Brulé,[8] while fully recognising the principle that in the pre-meningitic stage serum should be introduced into the circulation and that brilliant results may thus be obtained, consider that intravenous injection is too dangerous, and that in

carriers should be treated with sprays, but that only those with large numbers of meningococci and meningococci of the epidemic strains should be isolated. These dangerous carriers would be kept isolated until four successive weekly swabs from the naso-pharynx have been shown to be free from meningococci.

Treatment of Carriers.

Fresh air and sunshine are important; the positive carriers should be kept separate from those who have become negative so as to obviate re-infection, and carriers should be isolated according to their types so as to prevent cross infection.

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Among 360 carriers at Portsmouth Fildes and Baker[25] found that 212 were mild carriers with an average duration of 0·45 month, 126 being positive for one week only, and 148 chronic carriers with an average duration of 2·6 months. The chronic carriers were nearly all of the less pathogenic Types II. and IV., the latter being twice as numerous as the former. They also conclude that 33 per cent. of their carriers recovered spontaneously and that about 50 per cent. of those treated by various antiseptic sprays recovered, and that none of the methods had any conspicuous merit, the difference between 50 and 33 per cent. being due not to the efficacy of treatment but to the fact that the figures were calculated from two series of men.

At another naval depôt nine chronic carriers were rapidly cured by chloramine-T in an inhaling chamber. But at camp McClellan Robey[71] found that some carriers cleared up rapidly and that others were unaffected by various sprays four times daily, and concludes that sunshine and warm fresh air were more effective than spraying in clearing the naso-pharynx of meningococci.

Cleminson's[12] work suggests that the resistance of chronic carriers to disinfection may be due to factors in the carriers rather than to inefficacy of the sterilising methods. The accessory sinuses appear to be the chief sites of the saprophytic meningococci, and "firm mucous contact" between the middle turbinals and septum on the one hand, and the outer wall of the nose on the other, obstructs the ostia of the sinuses and so prevents the access of the antiseptic spray to the infected sinuses. To shrink up the mucosa, to dilate the ostia of the sinuses, and so allow free access of the antiseptic, a spray of adrenalin chloride 1 in 6000 saline solution was used before the flavine or other spray, and was followed by improvement in the results. It is also suggested that partial turbinectomy by throwing open the ostia of most of the accessory sinuses might accelerate the cure of chronic carriers; but the results of this procedure, if it has been extensively carried out, are not known. Cleminson finds that other factors rendering chronic carriers resistant to treatment are pyorrhœa alveolaris and pre-existing infection of the sinuses.

Precautions against droplet infection should, of course, be observed by those in attendance on cases of the disease; masks should be worn and the naso-pharynx frequently washed out with a mild antiseptic solution. The throats of nurses and attendants should be periodically swabbed for bacteriological examination.

Preventive Vaccination.

Prophylactic vaccination of the general population by meningococcic vaccine has been carried out when an epidemic outbreak is anticipated. A multivalent menigococcic vaccine was found by Sophian[30] and Black[5] to afford a high degree of protection lasting for 12 months, and after the outbreak of war this prophylactic measure was more extensively tested in England (Greenwood[39]), America (Gates), and in the Sudan (Chalmers and O'Farrell).

Greenwood reports that of 4000 persons inoculated twice at a week's interval, none had the disease, and with the caution of an expert statistician concludes that a prima facie case in favour of prophylactic inoculation has been made out. Among 3700 volunteers inoculated Gates found that three men who had received two or three injections had cerebro-spinal fever; in two of these the injections were probably given during the incubation period of the disease, but the third patient should have been immune when he went sick. Gates demonstrated specific meningococcic immune bodies in the blood serum of the inoculated men as compared with normal controls.

The dosage has varied in the hands of different clinicians: Chalmers and O'Farrell began tentatively with 5 million meningococci and did not get above 100 million; in Greenwood's cases a first injection of 250 to 300 millions was followed a week later by 1000 millions; Sophian and Black gave injections at weekly intervals of 100, 500, and 1000 millions, and Gates employed three injections, also at weekly intervals, of 2000, 4000, and 4000 or 8000 and found that these rarely caused more than the mildest local and general reactions. In exceptional cases with unusual susceptibility to the vaccine severe symptoms of meningism, sometimes suggesting the onset of meningitis, followed; but these manifestations did not last more than a few hours. According to Whitmore, Fennel, and Petersen[75] a multivalent meningococcic lipovaccine—namely, with an oily suspension, as in the T.A.B. lipo-vaccine of Le Moignic—diminishes the risk of a local reaction.

SERUM TREATMENT.

Serum treatment, which, though first employed by Jochmann, is chiefly due to Flexner's exertions, has greatly diminished the severity and mortality of the disease. As this was discussed in the section on prognosis no further figures need be brought forward; but the serum treatment must be efficient, and it is probably due to failures in this respect that the civil mortality (65 per cent.) in this country, as shown by Reece's figures for 1914–17, is so much higher than statistics published from hospitals.

Importance of Specificity of the Serum.

The use of serum is not so simple or so uniformly successful as that of antidiphtheritic serum, which is antitoxic, whereas antimeningococcic serum, possessing bacteriolytic, bacteriotropic (opsonic), and anti-endotoxic properties, is more likely to fail in its powers as a whole. Gordon[37] found that the anti-endotoxin in deficient in a considerable proportion of the samples of antimeningococcic serum supplied for therapeutic use, although they contained a good supply of opsonin, and that the clinical potency of a serum depends on its anti-endotoxic capacity. The existence of different types of meningococci with specific antibodies renders the success of the serum treatment less certain than in the case of antidiphtheritic serum. The widespread failure of the antimeningococcic serums available in 1915 in this country appeared to depend on the absence of antibodies specific to the infecting organisms, and stood out in striking contrast to the results obtained in 1916, when Flexner's multivalent and other serums were available.

The establishment of different types of meningococci and as a corollary the preparation of homologous serums so that a multivalent or pooled serum is given until the type of the infecting organism is determined when the specific univalent type serum is substituted, has already, as shown by Gordon

and Hine's analysis, greatly improved the results of serum treatment. The extreme importance of specificity in the serum treatment of the disease and the absence of any benefit from non-specific treatment, or protein shock therapy, of which an extensive trial has unintentionally been made, are noteworthy.

The important question, indeed, may be raised whether the intrathecal injection of inert serum may not do positive harm. As already mentioned, horse serum sets up an aseptic meningitis and favours the passage of meningococci through the meninges. It might, on the other hand, be argued that the increased number of phagocytes thus provided might do good. But it is significant that in 1915 the mortality among the naval cases treated with serum intrathecally was higher (61 per cent.) than among those treated in other ways (41 per cent.); and in this connexion another series of naval cases in that year may be quoted: among 21 cases treated with soamin alone there were seven deaths, or 33 per cent., whereas among 18 cases that received both soamin and antimeningococcic serum intrathecally there was a mortality of 11, or 61 per cent.

Some Difficulties in Serum Treatment.

The nature of cerebro-spinal fever differs from that of diphtheria, and may be regarded in the first place as a general hæmic infection or invasion which later, but not necessarily, attacks the meninges, whereas diphtheria is, like tetanus, a local infection which produces a toxæmia. As a result of the meningococcæmia, foci of infection, unaffected by intrathecal injection of serum, may persist and cause recrudescences of meningitis. Further, inflammation of the meninges, like that of other serous membranes, is prone to set up adhesions and so produce isolated loculi where the infective process, being out of the reach of the intrathecal injections of serum, continues to cause symptoms. Another result is that the foramina of exit of the cerebral ventricles become obstructed and the ventricles become distended with turbid fluid containing meningococci, or eventually a sterile hydrocephalus results. The persistence of symptoms from a general meningococcæmia or from an encysted infection, especially of the cerebral ventricles, may lead to a prolonged course of intrathecal injections which may cause grave symptoms and from the nature of the case cannot do good; for in these circumstances an intravenous or intra-ventricular injection of serum is required.

As another explanation of the failure of serum treatment it has been suggested that the meningococci may become fast to the serum, but this hypothesis must not be allowed to minimise the importance of giving a serum strictly homologous to the type of the infecting meningococcus.

Another factor rendering the serum treatment difficult is the occurrence of phenomena, variously called sero-toxic meningism or acquired intolerance of the meninges, about the time that the ordinary manifestations of serum disease are due. The symptoms resemble a relapse, but the cerebro-spinal fluid does not show meningococci and does contain sugar. If in these circumstances a fresh injection of serum be given, the patient may manifest severe pain, become delirious, show definite signs of meningitis (*vide infra*), and often goes down hill.

Human Serum.

In addition to the serum of immunised horses, the serum from convalescent patients has often been tried. In 1907 Ivy Mackenzie and Martin [31] treated 16 acute and 4 chronic cases with serum from convalescent patients, the average amount injected intrathecally being 15–20 c.cm., and obtained 10 recoveries among the acute cases (2 receiving their own blood serum). Fairley and Stewart recently modified this procedure by adding 5 c.cm. of blood serum from convalescent patients, proved to have a negative Wassermann reaction, to 20 c.cm. of a potent antimeningococcic serum. The addition of human serum was made with the object of reinforcement of complement. The mortality of the 10 acute cases thus treated was 30 per cent., whereas that of acute cases treated by serum without complement reinforcement was 50 per cent. It is obvious that when blood serum from a convalescent patient is employed for treatment, the type of the infecting meningococcus should be the same in the donor as in the recipient.

SERUM TREATMENT IN VARIOUS FORMS OF THE DISEASE.

The serum treatment of cerebro-spinal fever may be divided into: (I.) That of the general systemic infection before the meninges have been infected, or of the pre-meningitic stage; this is effected by the intravenous injection of antimeningococcic serum. The hypodermic or intramuscular injection of serum has also been advocated, but appears to be less effective for this purpose. (II.) That of meningococcic meningitis by the intrathecal injections of serum. (III.) That of closed meningococcic infections of the central nervous system, for example, of the cerebral ventricles or of foci isolated by adhesions from the intrathecal space, and so out of reach of serum introduced intrathecally after ordinary lumbar puncture. (IV.) That of other foci of meningococcic infection, the joints and the eye, by the local injection of serum. This category is insignificant in importance to the others.

(I.) *Serum Treatment of the Pre-meningitic Stage by Intravenous Injection.*

Comparatively recently it has been more generally realised that in the earliest stage of cerebro-spinal fever there is a blood invasion or septicæmia, and that this is usually, but not invariably followed by meningeal infection, and as a corollary that in this pre-meningitic stage the proper course is to introduce the antimeningococcic serum into the blood stream.

In addition it appears that the intrathecal injection of serum before the meningococci have invaded the meninges is not a harmless procedure. Austrian [1] proved experimentally that meningococci injected into the blood stream do not pass through the meninges and set up meningitis; this is prevented by the barrier set up by the meningeal-choroidal complex, and recalls Sherrington's [73] observation that healthy secreting membranes are not pervious to the bacteria. But Flexner and Amoss, [28] as well as Austrian, have shown that the defence of the meningeal-choroidal complex is broken down by injury, as can be done by the intrathecal injection of horse serum with resulting aseptic meningitis. The premature intrathecal injection of serum—namely, before the meninges have allowed meningococci to pass through, may thus determine meningitis.

The most efficacious method of introducing the serum into the blood stream is obviously by intravenous injection, and from experience of more than 100 patients thus treated Herrick [42] finds that it is both satisfactory and safe. His treatment aims at the sterilisation of the blood before the meninges have become affected and is an advance on the usual methods which are concentrated upon the later stage when meningitis is established. Large quantities (200–600 c.cm. in all) of serum are given intravenously and, when there is meningitis present, active spinal drainage and comparatively small intrathecal injections of serum are carried out. No bad effects followed the large intravenous injections and serious anaphylaxis was seen in only one case. Goldon [36] found that intravenous injections of 20 to 40 c.cm. were usually followed by more or less shock, with failure of the pulse and respiration, lasting about 15 minutes, and followed by a rigor and a rise of 2° to 4° of temperature.

Of the four classes of cases—the abortive, the ordinary, the severe, and the fulminating—Herrick's most brilliant results were obtained in the severe cases, the patients often coming out of coma with rapid recession of the rash and symptoms so that in 48 hours many are apparently out of danger; large intravenous injections reduced the mortality of the severe cases from 64 to 19 per cent. Subacute and chronic cases with cachexia, delirium, and other distressing symptoms are seldom seen, the course of the disease is shortened and the incidence of complications diminished. Out of Herrick's 265 cases 64, or 25 per cent., proved fatal, but out of 137 given ordinary intrathecal injections and less than 45 c.cm. intravenously 47, or 34 per cent., proved fatal, whereas out of 128 treated intrathecally with small doses and intravenously with large doses (50 to 800 c.cm. in all) of serum 19, or 15 per cent., proved fatal. In mild cases good results followed either of these forms of treatment. Goldon usually found that one intravenous injection was sufficient, and then, if meningitis was present, gave intensive intrathecal injections; out of 138 cases 29, or 21 per cent., proved fatal, but 16 of these were admitted in an unconscious state with a purpuric rash.

Some French physicians, such as Netter, [59] Sainton, [77] and Brulé, [8] while fully recognising the principle that in the pre-meningitic stage serum should be introduced into the circulation and that brilliant results may thus be obtained, consider that intravenous injection is too dangerous, and that in

most cases it is wiser to employ hypodermic or intramuscular injections. In adopting this conservative attitude they are, of course, fully aware of Besredka's method of desensitisation.

(II.) *Serum Treatment of Meningococcic Meningitis.*

The treatment of meningococcic meningitis by intrathecal injections of antimeningococcic serum, which exerts a bacteriological action on the meningococci, favours their phagocytosis, and contains an anti-endotoxin, was introduced by Flexner and Jobling [32] in 1907 on the grounds that the antiserum is thus brought into direct contact with the focus of infection and inflammation, and that the passage of colloids from the blood stream into the cerebro-spinal fluid is a slow and imperfect process in health, and probably also in inflamed states of the membranes. In 1917 Flexner [27] restated the position and pointed out that, as very little serum from the blood reaches the inflamed meninges, it is useless to inject it subcutaneously or intravenously in the expectation that it will exert any influence on meningococci in the subarachnoid space. In the same year, however, in conjunction with Amoss,[30] he showed that in acute poliomyelitis the immune bodies, though they do not pass through healthy choroid plexus from the blood to the cerebro-spinal fluid, are able to traverse them when inflamed; if this hold good as regards meningococcic meningitis, his earlier argument is partially weakened; but this is only of academic interest, for the success of intrathecal injection of serum in meningococcic meningitis has been proved beyond all question, and this method has superseded the easier one of hypodermic or intramuscular injection.

Doubtful cases should be submitted to lumbar puncture at once; if the fluid be turbid serum should be given; but if it be quite clear serum should be withheld unless meningococci be subsequently found, as the aseptic meningitis set up by serum may facilitate the passage of meningococci from the blood into the subarachnoid space. If the cerebro-spinal fluid be sterile, and especially when a blood culture shows meningococci, intravenous injections of serum should be given without delay; and, as the septicæmic stage of cerebro-spinal fever lasts on into the meningitic stage, the intravenous injections should be continued for a time, together with intrathecal injections.

Lumbar puncture and the injection of serum should be performed under a general anæsthetic or under the influence of an injection of scopolamine 1/100 gr., morphine 1/6 gr., and atropine 1/100 gr. in 5 minims of water, as employed at Haslar by Surgeon Lieutenant-Commander Adshead. The serum should be run in slowly and in a quantity smaller than that of the cerebro-spinal fluid removed; 20 to 30 c.cm. of serum should be given twice daily for some three or four days, for by this intensive treatment the best results are obtained. The continuance or omission of the injections is decided on the state of the cerebro-spinal fluid, the patient's general condition, and the temperature. With the new Medical Research Committee's serum the pooled serum corresponding to type I. and II. is given until the type of the infecting meningococcus is established, and then the corresponding monotype serum is substituted. The access of serum to the base of the brain is facilitated by raising the foot of the bed, and Ramond [69] recommends that the patient should lie for a time on his face in order to direct the serum to the region of the optic chiasma.

When any recrudescence or relapse appears serum treatment must be at once started again; when an interval of 10 days or more from the last injection of serum has elapsed steps must be taken to desensitise the patient, otherwise severe anaphylactic symptoms may appear; a very small (0·5–1 c.cm.) hypodermic injection of serum may be given 4 hours before the curative dose of serum is given intrathecally, or Besredka's method of rapidly repeated intravenous injections of minute but progressively increasing amounts of serum may be employed, which though elaborate obviates the delay necessitated by the simpler hypodermic method. Before the curative dose is given, 1/75 gr. of atropine should be injected hypodermically. As mentioned elsewhere, an anæsthetic prevents the occurrence of anaphylactic symptoms.

In order to prevent the accumulation of pus and fibrin in the subarachnoid space and the subsequent formation of adhesions, *irrigation with saline solution* is often practised, and an isotonic solution of sodium citrate (3·8 per cent.) has been recommended for this purpose by Rosenthal.[74] J. J. O'Malley [65] contrasts the results of simple lumbar puncture and administration of serum among 36 patients with a mortality of 33 per cent. with those of the same procedure with the addition of saline irrigation among 15 cases with a mortality of 13 per cent. Sheffield Neave has washed out the intrathecal space with saline solution containing 0·5 per cent. carbolic acid with beneficial results. In this connexion attention should be drawn to Flexner and Amoss's [31] results showing that lysol and protargol fail to benefit experimental meningococcic meningitis and exert an adverse influence by diminishing leucocytic emigration and phagocytosis.

The *number of intrathecal injections* of serum should be carefully considered, for it is probable that harm may result from a large number of lumbar punctures. Thus the cerebro-spinal fluid continues to collect, and as a result of repeated withdrawals an excessive secretion of cerebro-spinal fluid, perhaps comparable to cerebro-spinal rhinorrhœa, may be induced. Some prolonged cases, probably those with adhesions, appear to become resistant to serum, and sometimes intrathecal injections are followed by aggravation of the symptoms, such as headache and opisthotonos. Herrick who considers that signs of chronic or subacute caudal myelitis are common in convalescents as a result of injury from the needle, or the injury of serum, advises that if a satisfactory response does not occur after eight or ten intrathecal injections the injection should be discontinued and simple lumbar puncture performed only when signs of increased pressure demand it.

Grave symptoms and even sudden death during intrathecal injections have been ascribed to various factors, such as anaphylaxis, liberation of toxins by rapid lysis of meningococci, the toxic action of phenol often employed to preserve the serum, and, most important of all, increased intracranial pressure and distension of the closed cerebral ventricles. To avoid this a smaller quantity of serum than that of the cerebro-spinal fluid removed is important, and the gravity method of administering intrathecal injections has been advocated and practised, especially in America.

The blood pressure was found by Sophian to be lowered by lumbar puncture, and still further depressed by intrathecal injection of serum; he therefore employed blood-pressure observations as a guide to the amount of serum injected. Fairley and Stewart, however, found that the effect of lumbar puncture on blood pressure was variable, a rise being almost as common as a fall, and an initial higher pressure being followed by a fall and vice versa; but they agreed with Sophian in finding that a fall of blood pressure was commoner than a rise after intrathecal injection of serum. MacLagan [52] has never seen a dangerous fall of blood pressure from the gradual intrathecal injection of serum, and few authors appear to have thought it necessary to control the administration of serum by blood-pressure estimations.

Roskam [73] argues that an important factor in causing collapse, respiratory failure, and coma, after the intrathecal injection of antimeningococcic serum in quantities larger than that of the cerebro-spinal fluid removed is the presence of adhesions or lymph blocking the passage of fluid from the subarachnoid spaces into the ventricles. If these apertures be blocked, increased intracranial pressure is brought to bear on the brain and medulla. On the other hand, when the apertures remain patent the fluid passes into the ventricles and there is no increased pressure exerted. Whenever acute symptoms occur after intrathecal injection of serum the fluid should be allowed to run out of the theca, and hypodermic injection of atropine should be given, and if necessary, artificial respiration carried out.

Intrathecal injections of serum in rare instances are followed by *secondary infections* through the puncture wound, especially after a large number of lumbar punctures, with a rapidly fatal issue. I have notes of several cases of secondary streptococcic infection thus produced. Secondary infection may also occur through the blood-stream, and, as mentioned in Lecture II., Netter and Salanier [63] considered that this may be favoured by the injection of large quantities of serum, especially if it be not the type serum.

(III.) *Treatment of Closed Meningococcic Infections.*

Next to be considered is the treatment of closed meningococcic infections of the central nervous system which cannot be reached by ordinary intrathecal injections of anti-

meningoccic serum. In chronic cases in which lumbar puncture is either dry or brings away clear and sterile fluid, but in which the symptoms persist unaltered by intrathecal injection of serum, there may be adhesions cutting off parts of the spinal intrathecal cavity or more frequently closing the foramina of exit of the cerebral ventricles.

In some cases lumbar puncture is performed higher up so as to obtain cerebro-spinal fluid above the adhesions, and if turbid meningococci-containing fluid be obtained intrathecal injection of serum can be given. Cantas of Athens advocates superior vertebral puncture between the sixth and seventh cervical vertebræ, and this has been performed in some instances, but it is obviously dangerous from the risk of injuring the spinal cord.

When from the symptoms there is reason to believe that there is a closed infection of the cerebral ventricles—ependymitis or pyocephaly—the logical course is tapping and the injection of antimeningococcic serum. This method, practised first by Cushing and Sladen,[18] can be comparatively easily done in the infant before the anterior fontanelle is closed. Marcland collected 11 cases with 5 cures due to ventricular tapping, and contrasts these with 7 cases of untreated ventricular distension in infants found at the necropsy. In adults trephining and subsequent injection of serum is a more formidable procedure, and, according to Marcland,[34] there were 4 cures among 18 cases; more recently Landry and Hamley[48] had 1 recovery out of 5 cases trephined and injected, and Fairley and Stewart's 9 cases of trephining and drainage all proved fatal, though in some instances life was prolonged. It appears to be a desperate remedy for a desperate condition.

Stetten and Roberts[81] advocate the production of a wide opening in the corpus callosum, thereby obtaining prolonged drainage; this method is preferable to puncture with a trocar, which gives temporary relief only and so must be repeated. They record a successful result in a soldier aged 19. If necessary serum can be injected into the ventricles. In two desperate cases (one recovery) Cazamian[10] employed the orbito-sphenoidal route, practised by Bériel for the injection of salvarsan in general paralysis of the insane. In place of trephining and drainage Herrick recommends Cobb's method of breaking down adhesions around the foramen magnum and fourth ventricle by manipulations of the head under chloroform in order to relax the rigidity of the neck muscles. This method, which might suggest dangerous traction on the roots of the vagus, was often successful in causing a flow of cerebro-spinal fluid, and in one instance brought back respiratory movements after they had stopped.

A much less serious procedure advocated by Bloch and Hébert[6] for cases in which the meningococci may be encysted in situations in contact, but not in communication, with the meninges—for example, the fibro-vascular tissue of the choroid plexus—is the intravenous injection of serum. Intramuscular injection has also been employed for this purpose, but it is less likely to be successful. In this connexion Chiray's[12] description of the "reflex sign of pyocephaly" may be mentioned; in a few cases minute intravenous injections of serum, such as are used in Besredka's method of anti-anaphylaxis, are followed immediately by transient but intense vasomotor, respiratory, and cardiac disturbances.

(IV.) *Serum Treatment of Other Foci.*

Injection of antimeningococcic serum (5 to 10 c.cm.) is commonly advocated for suppurative arthritis due to meningococcic infection, but it is seldom necessary in this country. Serum has also been introduced into the pericardium, and even into the vitreous humour of the eye (Netter[60]).

SERUM DISEASE.

In the main the serum rash and other manifestations are much the same after intrathecal as after hypodermic or intramuscular injection; but some difference would naturally be expected on account of the injection into the close neighbourhood of the central nervous system. Serum disease in man is generally regarded as anaphylactic, but it must be borne in mind that there is a striking difference between the way in which man on the one hand and animals on the other hand react to a first injection of a foreign protein; in animals, and the problems of anaphylaxis have naturally been more elaborately studied in them than in man, the primary sensitising injection is not followed by the train of symptoms so familiar in man.

Frequency of Serum Reactions after Intrathecal Injections.

Flexner[28] remarks that possibly the manifestations of serum disease are more frequent after the intrathecal than after the subcutaneous injection of serum; and from comparison of the naval cases of cerebro-spinal fever with the reported incidence of serum disease in diphtheria I was at first inclined to this view, but further sifting of the evidence did not show that there was any proof of this, and Claude Ker,[46] who also investigated this question, came to the same conclusion.

Flexner's serum, which by the generosity of the Rockefeller Institute has been mainly used in the Navy, appears to be particularly prone to cause a rash; thus among 121 naval cases that recovered or survived more than ten days 81, or 67 per cent., had a serum rash, and among Ker's cases the percentage was even more—namely, 77. But this is not higher than the incidence (67 to 81 per cent.) of serum rashes in some series[72] of cases of diphtheria specially studied from this point of view. The variations in the incidence are therefore more probably due to peculiarities in the horses supplying the serum than to the method of injection. From comparison of series of naval cases it appeared that a serum rash was commoner in cases receiving intrathecal injections alone than in cases having both intrathecal and subcutaneous injections of serum.

Relation of Manifestations to Amount of Serum Injected.

Clinical experience shows that the severity of the rashes and other manifestations of serum disease varies directly with the amount of serum injected.

Serum disease, according to Longcope and Rackemann[49] depends on a reaction between the injected serum, which acts as the antigen, in the blood and antibodies formed in the cells of the tissues. During the incubation period of serum disease there is a constant amount of the foreign serum in the blood but none of the antibodies; when an explosive union between the antigen and the antibodies occurs the manifestations of serum disease follow, and their intensity depends on the amounts of antigen and antibodies present. If the amount of antigen be large and that of the antibodies small the manifestations of serum disease will be severe, prolonged and relapsing, and vice versa. The antibodies only begin to be extruded into the blood after the serum disease begins, and are a protective mechanism against these manifestations.

It is therefore obvious that the smaller the bulk of serum injected the less likely is serum disease to be severe, and this appears to have been shown by the rarity (3 per cent.) of serum rashes after the prophylactic injection (2–3 c.cm.) of the concentrated antitetanic serum (O'Brien[64]). But although, *caeteris paribus*, it is desirable to have a concentrated serum so as to avoid troublesome serum reactions, it is essential that the process of concentration should not diminish its curative powers, and in this connexion it is important to note that Miss A. Homer[44] has found that the immune bodies in antimeningococcic serum are mainly associated with the pseudo-globulin, and therefore that attempts to concentrate the serum by methods involving a heat denaturation of the serum proteins would considerably diminish the antibody content of the serum.

Serum Rashes.

It was stated by Currie[17] that an injection of antidiphtheritic serum just before a serum rash due to a previous injection might be expected may determine the appearance of a rash which otherwise would not have developed. Examination of the notes of the naval cases did not show that this sequence is established in cerebro-spinal fever. It is true that in a few cases lumbar puncture and the injection of serum have been performed the day before the rash appeared, there having been a previous interval of some days without the administration of serum. But such cases are, perhaps, more satisfactorily explained by the view that the symptoms which led to the lumbar puncture and the injection of serum were premonitory of the serum rash.

The serum rash is usually urticarial, erythematous, or morbilliform, and extremely irritating, but it may be scarlatiniform. In rare instances it is hæmorrhagic; this may occur in association with a sore throat or an infected wound or boils; cases of this kind have occurred in the Navy. But all cases in which a serum rash becomes hæmorrhagic are

not explained by the presence of infection. Landry and Hamley[48] mention a hæmorrhagic serum rash which was thought to be evidence of post-meningitic septicæmia until a blood culture proved negative. In another condition—namely, true anaphylaxis, the rash may be hæmorrhagic.

On the forty-eighth day of the disease, not having had any serum for 27 days, a man had an intrathecal injection of 20 c.cm.; seven hours later he vomited, had a purpuric rash, and was gravely ill. Next day the rash had faded but the right knee was full of fluid. He died seven days after the injection.

Quite commonly a serum rash appears, fades, and about two days later again becomes prominent; the first may be erythematous and the second urticarial, and both extremely irritating. These may be regarded as phases of the same reaction. In rare instances two serum rashes appear at such an interval as to justify the term double serum rash and to suggest two separate reactions, which might be supposed to be the result of injections on different days; a number of Currie's cases bear this interpretation. This, however, is not universally true, and the occurrence of two or three distinct rashes after a single injection of serum is now thought to be due to the successive appearance, at different time intervals, of sensitiveness to the different proteins—euglobulin, pseudoglobulin, and albumin—present in horse serum (Dale and Hartley[19]).

Arthritic and Other Manifestations of Serum Disease.

Another manifestation of serum disease is arthritic pain or less often effusion into the joints. The recognised association of erythematous skin eruptions and joint symptoms is explained by the assumption that the synovial membranes show changes similar to those in the skin. The arthritic manifestations are less frequent than those of the skin, but they occasionally occur without any recognisable cutaneous rash. The arthritic symptoms may accompany, precede, or, and this appears to be more usual, occur some three days after the appearance of the rash. Pain or stiffness is commoner than effusion. It does not appear that patients who have had early effusion into the joints from meningococcic infection are more liable than others to get seric arthralgia or effusion into the joints. The arthritic manifestations are toxic, and, like those of "scarlatinal rheumatism," do not react to salicylates.

In a small number of cases the serum rash is accompanied by œdema of the eyelids, scrotum, hands, and other parts, and at the same time there may be transient albuminuria. As the serum rash is so often urticarial it is not surprising that œdema—or "serous hæmorrhage" into the skin—should sometimes occur. Here it may be mentioned that the administration of calcium lactate gr. xv. for six doses, some days before the manifestations of serum disease are expected, may be tried in order to obviate them.

In some instances transient deafness about the time of serum disease may possibly be a manifestation of that condition (A. C. MacAllister); and I have been told by Captain E. H. Shaw, R.A.M.C., of transient loss of vision at the time of the serum disease. As an exceptional event de Verbizier's[52] case of severe epileptic convulsions with the status epilepticus coinciding with a well-marked serum rash and arthralgia in an epileptic, who had not had any fits during the fever, may be mentioned.

Seric Meningism and Meningitis.

The fever and constitutional disturbance preceding or accompanying the other manifestations of serum disease may be associated with recrudescence of meningitic symptoms, and a relapse is thus naturally suggested. This rare meningeal manifestation of serum disease is peculiar to intrathecal injection of serum, and though it occurs in a small proportion of cases should be more widely recognised in this country in view of the recent increase of cerebro-spinal fever. It has not, however, passed unnoticed. Netter and Debré[62] in 1911 gave a good account of it, and regarded it as a result of serotoxic œdema of the meninges. It may also be added that, as the mucous membranes originally attacked by diphtheria are liable to swell at the time of the serum reaction, an analogous sequence may be suggested in the case of meningococcic infection of the meninges.

If the *meningism* is part of the serum disease to be expected after intrathecal injection, the question arises why it is not noted more often. It does not appear to result from large quantities of serum given, for out of the nine naval cases showing these meningitic symptoms eight had less than 100 c.cm., and four of these eight less than 50 c.cm.; nor can it be explained as due to an intrathecal injection within a very few days of the appearance of the serum rash. That it is connected with some hypersensitiveness of the meninges is probable enough, but it is impossible to go beyond this vague statement.

These symptoms can be distinguished from a true recrudescence of meningococcic meningitis, for which an injection of serum is urgently necessary, by examination of the cerebro-spinal fluid for meningococci and the presence of sugar. If the cerebro-spinal fluid is clear, contains sugar, and is free from meningococci, there is no recrudescence of infection, and fresh intrathecal injection of serum may be followed by very severe pain, delirium, and other signs of meningitis. This is what Dopter[22] calls *seric meningitis*, and he explains the symptoms as due to the formation of a precipitate in the cerebro-spinal fluid.

Anaphylaxis.

True anaphylaxis may occur in a patient who has some time previously had an injection of serum, e.g., for diphtheria or as a prophylactic against tetanus. Although in the case of ordinary subcutaneous injections of serum anaphylaxis is, as a rule, more interesting than serious in its manifestations, the effect of an intrathecal injection of serum in a sensitised person, though fortunately uncommon, may be very grave. Although anaphylactic shock does not always occur when it might be expected, it is obviously advisable before giving the first intrathecal injection of serum to inquire if the patient has ever had a previous injection. If he is unable to give any information and there is reason to suspect that he has had an injection of serum—for example, evidence of a wound in a soldier from the front—the patient should, before receiving a curative intrathecal injection be desensitised. *(Vide supra.)*

The anaphylactic symptoms are severe collapse, fall of blood pressure, rapid and feeble pulse, pallor, vomiting, feeling of thoracic constriction, failure of respiration, rapid eruption of urticaria or even of a hæmorrhagic rash. In order to counteract these symptoms the injection of adrenin and atropine has been recommended.

In several cases in the Navy intrathecal injections of serum were given after an interval from the last injection sufficiently long for anaphylaxis to have fully developed, but lumbar puncture was performed under a general anæsthetic and symptoms of anaphylactic shock did not appear. Besredka pointed out that if the nerve cells are anæsthetised anaphylactic shock is prevented.

A man had cerebro-spinal fever in May, 1917, and recovered after having 110 c.cm. of Flexner's serum followed by a serum rash. On Feb. 19th, 1918, he again had cerebro-spinal fever; after one injection of 20 c.cm. of Flexner's serum he remained well for 23 days, when a relapse occurred; he then had two injections of Flexner's serum (20 c.cm. on each occasion) and recovered. These three injections were given under chloroform and ether and were not followed by any anaphylactic symptoms; both the attacks were bacteriologically proved to be meningococcic infection.

VACCINES.

Curative vaccines have been mainly employed in subacute or chronic cases when serum appears to be losing its effect, and in a number of cases has been followed by improvement and recovery. Most writers speak of the treatment in a non-committal tone, and Herrick argues that as relapses occur vaccine treatment is unlikely to be effective. Among 21 naval cases given a meningococcic vaccine, always in addition to other treatment, 5, or 23·5 per cent., proved fatal, the mortality of the 509 cases in the first four years of the war being 213, or 41·8 per cent. The vaccine should be autogenous, and may with advantage be sensitised. The dose varies in the hands of different workers:

Chalmers and O'Farrell[11] gave 200 million dead meningococci for the first dose and 500 millions two days later, and out of ten apparently hopeless cases had four recoveries. Boidin[7] gave every three or four days 200, 350, 500, and 750 millions. MacLagan[53] recommends 50 to 100 millions for the first dose, which is repeated and increased every three or five days. Fairley and Stewart[23] begin with 50 millions and increase by that amount until 600 millions are

given; out of 52 subacute and chronic cases 17, or 32 per cent., proved fatal, and of these 13 had internal hydrocephalus, the mortality of the remainder being only 7·7 per cent. Warren Crowe[16] and Colebrook,[14] who recommended vaccines much earlier in the disease, about the second or third day, gave much smaller doses, 1 million and 7½ to 20 millions respectively. These two workers wrote of the epidemic of 1915 when the serum available in this country was inert. The usual reaction is slight, with some headache and fever.

In serious cases Boidin recommends the production of a "fixation" abscess by the injection of 1·5 c.cm. of turpentine into the subcutaneous tissues of the thigh, in addition to the use of an autogenous vaccine, and reports that as a result there is often definite improvement and sometimes cure when the abscess is opened; in some cases he found it necessary to produce a second "fixation" abscess.

OTHER METHODS OF TREATMENT.

Apart from meningococcic serum, and perhaps vaccines, other forms of treatment are of very subordinate importance and, except when serum cannot be obtained or is inert, as it appeared to be in this country in 1915, are mainly of historical interest.

Surgical Measures.

Lumbar puncture temporarily relieves pressure and headache, but it is not an efficient radical measure; the drainage is at best intermittent, and from this point of view the more drastic method of laminectomy and draining the spinal subdural space is more logical. This was done in the pre-serum days; Osler[66] referred to unsuccessful cases operated upon by Cushing (2) and one under J. H. Musser's care. In 1899 the late Herbert Allingham[73] performed laminectomy in a patient under my care who recovered with complete deafness, but the case was not bacteriologically proved to be meningococcic. In posterior basic meningitis the occipital bone has been trephined and the posterior subarachnoid cistern drained (Ballance[2]).

In a brief review of surgical measures undertaken to secure permanent drainage Herman and Feldstein[40] do not consider it proved that any permanent benefit resulted. But possibly this difficulty may be overcome. Chronic hydrocephalus is, in the great majority of cases, the result of a past meningitis (Weber,[83] Hildesheim[43]), and for this sequel of cerebro-spinal meningitis Dandy[20] advocates the radical operation of excision of the choroid plexuses of both lateral ventricles in cases in which the internal hydrocephalus is "communicating"—namely, not entirely cut off from the subarachnoid space; in this way the main source of the cerebro-spinal fluid is removed, but the choroid plexus of the third and fourth ventricles will secrete a sufficient amount of fluid.

Treatment with Soamin and Hexamine.

Soamin was first used in cerebro-spinal fever by T. A. Johnston,[45] who in 1910 published two cases that recovered after intravenous injections. Shircore and Ross[78] subsequently gave intramuscular injections of 5 gr. on the first and second days and 3 gr. on the fourth day to 127 cases in British East Africa; of these, 37 died within 60 hours and were regarded as hopeless under any kind of treatment, and of the remaining 90 cases 56, or 62 per cent., recovered. In 1915, when Low[50] again drew attention to its use, soamin was employed intramuscularly in a certain number of cases. In the Navy during that year 21 cases with 7 deaths, or 33 per cent., were treated by soamin alone, and 18 cases with 11 deaths, or 61 per cent., by soamin and intrathecal injections of serum. Comparison of these two series certainly suggests that the intrathecal injection of serum did harm.

During the four years of the war soamin, either alone or in combination with various forms of treatment, was given to 53 naval cases, with a mortality of 23, or 43·4 per cent.; this is higher than the mortality of 30 per cent. among 214 cases treated during the second, third, and fourth years of the war by Flexner's serum either alone or in combination with other brands of serum. Although Batten[4] suggested that it would be safer to employ salvarsan, bad effects, such as optic atrophy, from soamin have not been reported in this disease; one naval case received 42 gr. intramuscularly without any harm. It is unlikely that arsenic compounds would have any effect on meningitis, but conceivably they might do good in the septicæmic stage. In a few instances antimony tartrate has been given intravenously.

Hexamine, which owes its antiseptic power to the liberation of formaldehyde in an acid solution, has been extensively tried in meningitis on the basis of Crowe's[15] observation that it deferred or prevented experimental streptococcic meningitis. Presslie and Lindsay[68] speak well of it, but in general the clinical results have been most disappointing, and it is obvious that formaldehyde was not likely to be liberated in the cerebro-spinal fluid. Guest and Fairley[24] gave it in large doses by the mouth intravenously, and intrathecally to 20 cases with 80 per cent. mortality, and found that when given by the mouth hexamine and not formaldehyde appeared in the cerebro-spinal fluid. In a similar though short trial of helmitol, which liberates formaldehyde in an alkaline solution, they obtained more encouraging results.

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FILARIAL INFECTION IN MACEDONIA.*

REPORT OF TWO CASES OF *FILARIA CONJUNCTIVÆ* (ADDARIO) IN MAN, WITH THE FIRST RECORDED DISCOVERY OF THE MALE WORM.

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SEARCH into the literature on filariasis yields evidence of the extreme rarity of infection by *Filaria conjunctivæ*—a condition confined in its geographical distribution to South-East Europe, known to occur in horses and asses, its normal hosts, and seldom developing in man. Records of six examples of human infection exist, and in every case the solitary female worm, usually immature, only has been found. The first of the two cases to be described provides the only record hitherto of the discovery of the male type of *Filaria conjunctivæ*. Although this parasite. first so named in 1885 by Addario,[1] was obtained from the eye, it is not restricted to that region, for it has been described in 1906 by Alessandrini[2] as occurring in the forearm in a case very similar to that recorded here. The two patients, one of whom, a private in the R.A.M.C., with 18 months' service in Macedonia, had not previously been out of England, the other a Serbian, came under treatment at the same General Hospital attached to the Royal Serbian Army, the former in February, the latter in June, 1918.

Description of Cases.

CASE 1.—Pte., R.A.M.C., admitted to hospital under Captain A. A. Lees, M.C., R.A.M.C., in February, 1918, with a lump, the size of a filbert nut, on the outer side of the upper part of the left forearm, which had been intermittently swollen for the previous two months. On removal under local anæsthetic the tumour, which resembled a lymphatic gland in appearance, was cut into and a thread-like worm suddenly protruded for a distance of three-quarters of an inch. The specimen was then sent to the laboratory for investigation. Two days later the epitrochlear gland was removed from the patient's left arm for microscopical examination. The subsequent course of the case was uneventful.

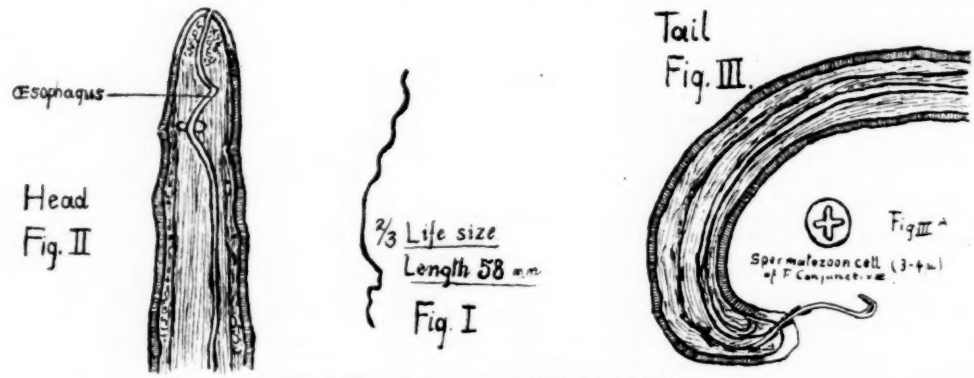
Pathological report.—Gentle traction on the end of the worm protruding from the tumour resulted in its complete removal, but in three portions, the original incision into the excised nodule having divided its length in two places. To the naked eye the worm was semi-transparent white in colour and showed faint but definite transverse marking. When placed in saline it exhibited slight waving movements for a short time. From the severed ends of the cut portions there poured a copious stream, which created a visible cloudiness of the saline; some of this was collected and in stained preparations showed the presence of a number of very small round cells 3 to 4 microns in diameter, displaying internally a faint cruciform structure; in all probability spermatozoa, which in nematodes, Dr. R. T. Leiper informs me, are aflagellate.

After preliminary examination in saline, the worm was dehydrated in solution containing 70 per cent. alcohol and 5 per cent. glycerine, and subsequently mounted in glycerine jelly.

Measurements.—Length, 58 mm. (Fig. I.); greatest breadth (towards the head), 0·46 mm. (at a distance of 2 mm. from the end); average breadth 0·35 mm. Breadth of head, 0·2 mm. (at a distance of 0·1 mm. from the end); breadth of tail (at the bend), 0·25 mm. (at the extreme tip), 0·1 mm.

Microscopical examination. I. *Male filaria.*—Under the low power by transmitted light the substance of the worm appears of a brownish colour, invested by a transparent cuticle about 8 μ in thickness and composed of an inner and an outer layer. Throughout the greater part of the length of the worm the cuticle shows fine transverse striation about 1 to 2μ apart, but not apparent in the portion enveloping the head and the extreme tip of the tail. Beneath the cuticle and running in the long axis can also be seen the longitudinal striation of the dorsal and ventral musculature, by contraction of which the envelope is thrown into shallow transverse folds giving the faintly corrugated appearance visible, as already mentioned, to the naked eye at the original examination. The anterior extremity (Fig. II.) tapers from a width of 0·4 to 0·2 mm. and is blunt-pointed without obvious papillæ protecting the minute central oral aperture. At this point the cuticle is invaginated to communicate with the fine cuticular lining of the pharynx and its prolongation into the œsophagus. At a distance of 0·4 mm. from the orifice the alimentary tube is deflected laterally in a sharp angular bend to the right followed by a broad loop to the left, and is then continued on in a fairly straight course, but at various points it is possible to make out the fine coils of either the mid and hind gut or the genital tubules. On either side of the anterior end of the tube are seen small groups of tissue, probably framework supporting the nerve structures encircling the œsophagus. The caudal end (Fig. III.) is curved at a blunt angle towards the cloacal aperture at a distance of under 0·1 mm. from the tip, and projecting from the aperture is seen a delicate filamentous spicule, part of the copulatory organ 0·25 mm. in length. No papillæ whatever are to be made out on the tail.

II. *Tumour and gland.*—The nodule from which the worm had been removed was examined in the fresh state, but failed to show the presence of a second or female worm or evidence of microfilariæ in the wall of the cystic interior. Sections show the nodule to be composed of fibrous connective tissue and round-cell infiltration traversed by collapsed spaces lined with what are possibly the remains of a flattened endothelium. These spaces may represent original lymph channels blocked by the lodgment of the filaria and subsequently shut off and enclosed by the resulting zone of inflammatory reaction and fibrous connective-tissue formation. (Fig. IV.) No filaria or microfilariæ could be seen in the sections. The excised epitrochlear gland revealed nothing abnormal either in smears from the fresh tissue or in stained sections.



FIGS. I.–III. *Filaria conjunctivæ* (Addario), ♂ (Case 1).

Examination of the patient's blood were made on several occasions, both by day and night in fresh and stained films, but failed to show the presence of any microfilariæ and gave no evidence of leucocytosis. A differential leucocyte count taken on the day after the operation showed, per cent.: Polymorphs, 47; large mononuclears, 2; small lymphocytes, 38; large lymphocytes, 8·5; eosinophils, 3·5; basophils, 1.

CASE 2.—A Serb was admitted to hospital on June 27th, 1918, under Captain McDougall, R.A.M.C., suffering from a tumour on the right side of the nose, which had given rise to inflammatory swelling of the face below the orbit for the

* Paper read before the Society of Tropical Medicine and Hygiene.

previous two months. At the operation performed by Major G. P. Mills, R.A.M.C.(T.), a small cyst was removed and found to contain opaque glairy fluid and a delicate filiform worm measuring about 3¾ inches (94 mm.). Blood-film examinations of the patient on two separate occasions failed to show any microfilariæ.

Thanks to the kindness of Captain Lees, who sent me the notes of this case together with the cyst and filaria, I was able to submit the specimens of the two cases above recorded to Dr. Leiper, who has identified them both as belonging to the same species; in the one case the mature male, the first hitherto reported, and in the second case the immature female of *Filaria conjunctivæ* of Addario.

The female specimen is incomplete, and unfortunately the head is missing; what remains measures 94 mm., but the character of the finely striated cuticle and the appearance of the blunt pointed tail leave little doubt as to its sex and species. The cyst which contained the worm measured ¾ × ½ inch, and was too friable to admit of section-cutting. Search with a hand lens and films from the under wall failed to reveal a second filaria or any embryos. Moreover, the absence of embryos from the body of the worm is evidence of its immaturity—a feature also of most of the few recorded specimens of *F. conjunctivæ*.

Measurements.—Length (incomplete), 94 mm. Breadth, 0·5 mm. Thickness of cuticle, 7–8μ. Breadth of tail, 0·15 mm.

As in the male specimen, the cuticle is transparent and marked by very fine transverse striations 1–2μ apart and visible throughout the length to the tail. Viewed by transmitted light under the microscope the substance of the worm, between the cuticular layers on each side, is of a brownish colour, and shows the coarse coils of the uterine tubules throughout the greater part of its length crowded with immature ova measuring 3–4μ. In addition can be seen the fine longitudinal markings of the muscle fibres. The tail differs from the male in the absence of spicules, in not showing any upward curve and ending abruptly in a

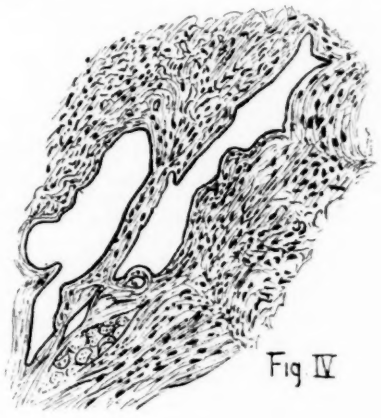


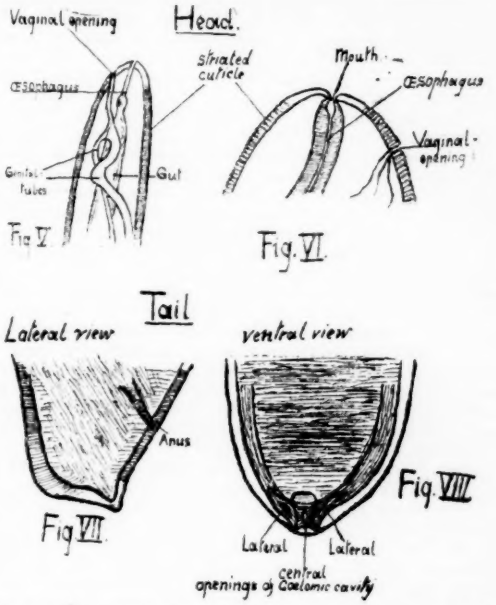
FIG. IV. Section of filarial tumour of *F. conjunctivæ* from left forearm of Case 1 showing cystic spaces, fibrous tissue, and small-cell infiltration.

blunt point. The anus is not visible, and there are no papillæ to be seen. The tip of the tail, viewed from the side, shows one of the lateral pits, as described in Grassi's detailed account of the anatomy of the worm, corresponding to the point at which the cavity of the cœlom pierces the external cuticle and apparently forms a very small short canal measuring 4–5 μ across.

Previously Recorded Cases in Man.

Though first named by Addario[1] in 1885 as *Filaria conjunctivæ*, this species had been already observed but not named by Dubini,[2] who found the immature female worm measuring 115 mm. in the eye of a man in Milan. Addario's specimen of the female worm, enclosed in a nodule the size of a pea and measuring 95 mm., was extracted by Vadela from the conjunctival sac of the right eye of a woman, aged 70, a native of Catania, in Sicily, in whom a year later a second worm was found in the same eye. Babes[4] also had described the same species at an earlier date in 1879 and 1880 as occurring encysted in a calcified nodule in the gastro-splenic omentum of a woman in Budapest. He named it *F. peritonei hominis*. This specimen was an immature female measuring 190 mm.

In 1887 Grassi[5] published a full description of the anatomy of the mature female worm and named the species *Filaria inermis* on account of its "unarmed" appearance due to the absence of papillæ from the head. The female specimens so far recorded in man range in length from 90 to about



FIGS. V.–VIII. *Filaria conjunctivæ* (Addario), ♀ syn. *F. inermis*—(after Grassi).

200 mm., although met with in horses and asses as short as 50 to 60 mm. The question of the differences in length is, however, one depending on the degree of maturity of the worm. Grassi considered that his specimen differed from that of Addario, and therefore described it under a new name as belonging to a separate species. But it is now generally agreed that *F. inermis* is synonymous with *F. conjunctivæ*, as are also Babes's *F. peritonei hominis*, Pace's[3] *F. palpebralis*, obtained from a cyst in the upper eyelid of a Sicilian native of Palermo in 1887; Rivolta's[5] *F. papillosa*, a mature female worm measuring 5½ cm. found in the eye of an ass in Pisa, and *F. apapillocephala* of Condoretti.[6]

The most recent example of *F. conjunctivæ* was recorded by Alessandrini[2] in 1906. This case is of particular interest, for the site of worm was almost identical with that in Case 1. A painless tumour had persisted for 13 months on the outer surface of the upper part of the left forearm of a woman aged 25. Subsequently the arm became painful and swollen, and an abscess, which had formed, burst, discharging pus, and with it the filaria. Alessandrini suggests that the infection had been conveyed from a horse or ass through the bite of the *Chrysops excutiens* fly.

Remarks.

The male filaria obtained from the arm in Case 1 was at first regarded as possibly belonging to the species *Onchocerca volvulus* (Leuckart, 1893), which is well known to occur among the natives of West and Central Africa, giving rise to the formation of subcutaneous nodules in various parts of the body. Native French Colonial troops from the Senegal were frequently passing through the hospital, and were thought likely to have provided a possible source of infection through the agency of a mosquito or some biting fly. The question of geographical distribution therefore seemed to have been accounted for, and on clinical grounds also there was some support in favour of this filaria belonging to the *Onchocercæ*. Such access as was possible to the literature of onchocerciasis in Salonika showed, however, that though the worm presented certain resemblances in its fine cuticular striation and the absence of papillæ from the head, it was of abnormal length for the male *Onchocerca volvulus*, which has not been recorded longer than 35 mm., and its tail showed

none of the typical terminal papillæ presented by that of the *Onchocerca;* further, it was the only worm present in the tumour. Its identity was therefore unsettled.

It was not until my return to England some months later that I had an opportunity of consulting Dr. Leiper, who unhesitatingly pronounced the specimen not to belong to the *Onchocerca volvulus* on the following grounds: 1. The geographical distribution—*O. volvulus* has never yet been found in Europe or outside Africa. 2. The structure of the tumour enveloping the worm is more spongy and much less fibrous than in the nodules of *O. volvulus*. The latter also invariably contain at least two females and several male worms and swarm with embryos.[7] 3. The appearance of the cuticle is quite different, the transverse striations being finer and there being a total absence of the coarse ridge-like cuticular folds common in the *O. volvulus*.[8] 4. The formation of the tail, including the absence of any terminal papillæ, is altogether unlike that of *O. volvulus*.

Dr. Leiper has further identified the two specimens as being the male and female types of *F. conjunctivæ* of Addario. The anatomical structure and appearance of the two specimens bear every resemblance to this species, whose synonyms have already been mentioned. *F. conjunctivæ* has hitherto only been found singly, usually in a state of immaturity, within the substance of small spongy fibro-cystic nodules occurring in the neighbourhood of the eye, but not restricted to that region. So far as at present known, its geographical distribution is confined to South-Eastern Europe.

Source of infection.—Both cases here described occurred in the neighbourhood of horse or mule lines, but the animals not being regarded as possible hosts were not examined. In elephantiasis (*F. bancrofti*)—possibly also in onchocerciasis, for the two conditions have been found together in a number of instances in Central Africa—the transmitting agent of infection is known to be the *Culex fatigans*[10] and other varieties of mosquito. It is, therefore, possible that transmission of the embryos of *F. conjunctivæ* may be effected by a mosquito or a biting fly, such as *Chrysops exutiens* or the stable fly *Stomoxys calcitrans*, the intermediary hosts of *Filaria loa*.[11]

Presence of microfilariæ in the blood.—Neither of the patients, though examined both by day and night, showed any microfilariæ. In the existing records of the few cases of *F. conjunctivæ* no mention has been found as to the condition of the blood. This and the nature of transmission of infection, as to whether the filarial embryo may develop at the site of its introduction, or, after gaining the blood or lymph circulation, become lodged in a capillary and there give rise to the formation of the fibro-cystic tumour, are important points requiring investigation.

Occurrence of other forms of filariasis in Macedonia.—As the result of inquiries made of several distinguished French and Serbian pathologists, to whom I showed the male specimen in Salonika, including Professor Lisbonne, M. Joyeux, and Dr. Hirschfeldt, I learnt that no cases of filariasis at all resembling that of Case 1 had come to light among French or Serbian troops up to June, 1918, also that in spite of the number of native troops from the Senegal no case of onchocerciasis had been reported.

This was also confirmed by M. Gau, pathologist to the 3rd French Hospital, who was making a special study of the subject of filariasis among native Colonial troops from Madagascar, Senegal, and Indo-China. He had met with three cases of infection by *Filaria loa*, and in the course of several hundreds of blood examinations had found the embryos of *F. nocturna* and *F. perstans* in a certain percentage of African natives, who, as carriers, thus become potential sources of the spread of filarial disease in Macedonia through the transmitting agency of the ubiquitous mosquito. As a result it is very conceivable that the geographical distribution of filariasis may in future embrace regions where infection by *F. bancrofti* and *loa* have been quite unknown.

In conclusion, in addition to my indebtedness to Dr. Leiper, without whose kindness and wide experience it was impossible to identify the filariæ, I have to express my special thanks to Captain Lees for his help in connexion with Case 1 and his kind thought in forwarding me the specimen and notes of Case 2, to Major Mills and Captain McDougall for permission to publish the case, and to Lieutenant-Colonel C. M. Wenyon, C.M.G., R.A.M.C., for kindly providing me with sections of the tumour from Case 1.

(Continued at foot of next column.)

A STUDY OF THE EPIDEMIC COMMONLY KNOWN AS "SPANISH INFLUENZA."

BY DR. E. FOLLEY.

THE strange and inconsistent forms of "Spanish influenza" warrant the belief that several distinct epidemics may prevail at the same time. After careful perusal of French and foreign treatises, and examination of many patients, I conclude that we are in presence of one and the same disease.

Symptomatology.

The disease is likely to show the following symptoms:—

1. Diminution of arterial tension, mainly towards minimum tension.
2. Irregularity and variation in amplitude of pulse.
3. Weakening and even imperceptibility of first sound of heart.
4. Early cyanosis of finger-nails.
5. Enlargement of spleen and slight enlargement of liver.
6. "Sergent's white line," earthy hue of skin, scowling countenance, considerable asthenia, pupillary oscillations, persistent sleeplessness.
7. Slight delirium when temperature is very high, which frequently increases when it falls. Delirium may occur when temperature is normal.
8. Irritability, in contrast with the intellectual torpor; considerable difficulty in collecting one's thoughts and formulating ideas. Forebodings of death, sadness, and violent fits of tears.
9. Signs of the lungs being affected, but in no precise locality; varying with change of position, the sloping portion of the lungs is affected on the patient standing, and the back on lying down.
10. The expectorations, in most forms with pulmonary localisation, are frothy, and contain thin streaks of dull red hue, later changing to whitish or greenish.
11. Slight diarrhœa in most cases, of a fugitive and typhoidal character; constipation in other cases. Hæmorrhage in alimentary canal.
12. Urine clear and abundant; never has appearance of so-called "febrile urine"; hæmaturia rare.
13. Hæmorrhage is likely in any mucous membranes (epistaxis).
14. Cardiac syncope, preceded by slow and weak pulse, is extremely frequent. Death always takes place as the result of cardiac syncope and may occur in cases apparently very mild.

This symptomatology points to a specific disease for two reasons: (1) The majority of these symptoms are noticeable in practically all cases of "Spanish influenza"; (2) the whole of the symptoms may be reproduced in man.

I now give an account of the result of accidental inoculation.

Accidental Inoculation with Virus.

On Oct. 27th, 1918, my left thumb was bitten by a rat when daubing its nose with the expectorations mingled with blood of a woman very seriously affected by the disease. On the 28th cyanosis was noticeable in left fingers; radial pulse was no longer perceptible; sensation of intense cold. Right arm unaffected. Fits of fainting and bradycardia. From Oct. 29th to Nov. 4th several fainting fits took place; pronounced lack of tension; irregularity and fluctuations in strength of pulse. On Nov. 4th a swelling appeared in region of bite (at no time resembling an abscess) and remained until end of December. Irregularity and fluctuations in pulse increased. Considerable asthenia, the earthy hue of skin, and "Sergent's line" persisted for about ten days.

About Nov. 15th a short infrequent cough became noticeable; a few frothy expectorations containing fine

(Continued from preceding column.)

References.—1. Addario, C.: Si di un Nematode dell'Occhio Umano, (Abstr.) Centralbl. f. Bacteriol., 1887, i., 24. 2. Alessandrini, G.: Nuovo Caso di *Filaria conjunctivæ*, add. bol. 20c. Zool. ital, 1906, 2a. ser., vii., 233. 3. Fantham, Stephens, and Theobald: Animal Parasites of Man, London, 1916, 404, 405. 4. Babes: Uber einem im menschl. Peritoneum gefund. Nemat., Arch. f. path. Anat., 1880, lxxxi., 158. 5. Grassi, B.: *Filaria inermis*, ein Parasit des Menschen, des Pferdes, und des Esels, Centralbl. f. Bacteriol., 1887, 617. 6. Brumpt: Précis de Parasitologie, Paris, 1915, 471. 7. Ibid., 518. 8. Parsons, 1908: Parasitology, i. (No. 4), 362. 9. Dubois, 1916: Le Rôle Pathogène de *Onchocerca volvulus*, Bull. Soc. Path. Exot., ix., 305-309. 10. Manson: Tropical Diseases, 6th edition, 1917, 691. 11. Ibid., 783.

streaks of bright red blood. In the left base of the right lung inspiration and expiration produced a blowing sound; vesicular murmur became inaudible; dyspnœa and sensation of constriction of thorax. "Sergent's white line" disappeared; persistent sleeplessness, intellectual torpor and considerable asthenia; abundant polyuria, with clear urine. Up to Dec. 12th these symptoms increased. My condition became alarming; adrenalin, strychnine, and all cardiac tonics produced no effect. On that date, when a serotherapic treatment (described below) was commenced the symptoms were: hypotension, fits of coughing and slow action of heart, irregularity in strength of pulse, at times filiform. Disappearance of first sound of heart. Spleen twice its normal size. Earthy complexion, reappearance of "Sergent's white line." Vitreous appearance of the eyes, irritability at the slightest noise, asthenia, impossibility of thinking, loss of memory, diminution of consciousness, fits of polypnœa. Pulmonary signs identically as before. Urine very abundant. Diarrhœic stools. Constant syncopal tendencies with fainting fits at intervals. Abnormal pupillary reflexes. Extremely painful tumefaction of left thigh on inner side; pains in muscles and joints.

Bacteriological findings.—This laboratory mishap caused a disease in which were reproduced all the symptoms of the epidemic discussed. During the first stage of the disease I isolated a coccobacillus from the swelling on the thumb and in the final stage it was rediscovered in my venous blood by collecting at least 40 c.cm. in a globe of 200 c.cm. capacity. The blood was left standing at 12° C. (about 54° F.) for several days. A white film formed, fragments of which in the usual media yielded colonies consisting of a small mobile coccobacillus, with bipolar colouration and of a non-adhesive nature. The characters of the organism will be described later.

Rats and guinea-pigs appear to resist inoculation, but mice are extremely sensitive and are subject to fits of cyanosis, dyspnœa, polypnœa, and agitation. These fits become more frequent and longer. Finally, after intense excitement and loss of all sense of balance or equilibrium, the animal passes into a state of complete prostration with cyanosis all over the body. Respiration is then imperceptible, whilst the heart beats at long intervals. The animal moves when touched and runs about when pinched. The temperature drops, the animal's movements constantly decrease, and it finally dies. In the mouse the total development of the disease extends over about a month and a half. The coccobacillus of "Spanish influenza" is only constantly met with in the nervous centres of mice.

Treatment with anti-plague serum.—The coccobacillus has been isolated in a great many cases. It is noteworthy that it generally disappears from the blood in circulation when complications exist and rises in temperature take place. Certain symptoms of the epidemic resemble hæmorrhagic septicæmia, accountable for by the cultural characteristics of this coccobacillus. It was therefore logical to employ a serum obtained with a microbe of this group; the anti-plague serum, for example, which is always available. As a matter of fact, this serum protects mice against inoculation by the coccobacillus, and can even cure mice affected by the disease.

After the first injection of 25 c.cm. of anti-plague serum my fainting fits and other circulatory phenomena disappeared. The advanced stage of the disease, however, needed the contents of ten bulbs to effect a complete cure. Patients with pulmonary complications have been successfully treated with the same serum, whilst in others nervous disorders comprising ataxo-adynamia, &c., rapidly disappear. Since adopting this treatment intravenously for patients with fainting fits (syncopes), and subcutaneously in other cases, I have not had a single death among patients with "Spanish influenza"; indeed, convalescence has been remarkably short.

This disease, the symptoms of which are well defined, has nothing in common with the feverish elevation which Nicolle and Lebailly produced in certain subjects by injecting a filtered solution of expectorations. The development of the disease here described takes place without any considerable rise in temperature; the period of incubation is very short, whereas the above authors noticed a high fever and an incubation of five to six days.

Paris.

GAS GANGRENE

DUE TO INFECTION WITH A NEW PATHOGENIC ANAEROBE—THE *BACILLUS TUMEFACIENS*.

BY W. JAMES WILSON, M.D., D.Sc., D.P.H.,

BREVET MAJOR; PATHOLOGIST TO A GENERAL HOSPITAL, B.E.F.; DIRECTOR OF THE PUBLIC HEALTH LABORATORIES, QUEEN'S UNIVERSITY, BELFAST.

THE importance of bacteriological control in assessing the value of serum in the treatment of gas gangrene is illustrated by the following case, the investigation of which led to the discovery of a new pathogenic anaerobe. If the cultural characters of the flora of the wound had not been carefully studied one would have concluded that the anti-gas gangrene serum employed had completely failed to control the infection. As a matter of fact, the serum had no beneficial effect, but the explanation proved to be that neither *B. perfringens*, *B. œdematiens*, nor *Vibrion septique* (against infection with which the serum was potent) was present in the lesions, but the *Bacillus tumefaciens*.

It is satisfactory that the virulent anaerobes of gas gangrene are not so numerous as might have been anticipated, so that there is every prospect of a serum being prepared which will control the condition in the majority of instances. But an occasional case like the one about to be described will be found which would require a serum specific for the special and unusual pathogenic microbe.

Account of Case.

Clinical history.—Pte. W. R., aged 23 years, was wounded on Sept. 29th, 1918. He had a penetrating wound of the frontal bone on the left side leading to a hernia cerebri, also a gunshot wound of the left arm, but the injury which eventually caused his death from gas gangrene was situated in the left thigh.

On Oct. 4th the thigh was much swollen but not tympanitic. On incising the skin Major J. Everidge, R.A.M.C.(T.F.), called my attention to the great amount of œdematous fluid present. This surgeon after a deep dissection found a small piece of metal and fragment of khaki cloth in the semimembranosus muscle. Some gas escaped when the foreign bodies were reached, and the muscle in their neighbourhood was pale red and very friable. The lower half of the semimembranosus muscle was carefully dissected out, and it appeared that all the invaded tissue had been removed, and it was expected that a good result would follow the operation.

At the time of the operation 50 c.cm. of Weinberg's serum were injected subcutaneously into the neighbourhood of the axilla. The 50 c.cm. were made up of 20 c.cm. antiperfringens, 10 c.cm. antiœdematiens, and 20 c.cm. antivibrion septique sera. On Oct. 5th 60 c.cm. of the same sera were given, the dose for antiperfringens being increased to 30 c.cm. In spite of the surgical and serum treatment the gas gangrene advanced and the patient died at 1 A.M. on the 6th.

At the post-mortem examination the hamstring muscles were extensively involved in the gangrenous process, there was gas under the skin of the thigh, and much œdema, especially at the inner side. The patient presented the usual clinical picture of gas gangrene and this was the cause of his death.

Bacteriological Examination.

Films made from the muscle at the site of the missile showed numerous Gram-positive bacilli, some of them containing a central spore; there were also present a few enterococci. Œdema fluid squeezed out from the muscle higher up contained sporing bacilli in considerable numbers, but no cocci.

At first I thought I was dealing with *B. welchii*, but further examination demonstrated that the *B. welchii* was not present and that the infecting agent was a bacillus *sui generis*. Along with the enterococci a few bacilli of the *B. tertius* class were isolated, but these were probably of no importance in the pathological process.

In accordance with my routine procedure[1] pieces of muscle removed at the operation were planted into (1) lactose brain broth; (2) brain broth and (3) rubbed over the surface of a laked blood agar plate; (4) a small piece was also added to a tube of salicin broth and boiled for one minute and then rapidly cooled. A symbiotic cocco-bacillus was added to this tube, and on incubation overnight acid and gas were formed. It was from this culture that most of our experiments were carried out, but the same bacillus was present on the blood agar plate and in the lactose brain and broth.

As it is most important in the case of the study of anaerobes to be certain that one is not dealing with mixed cultures, I may briefly relate the steps in the isolation of the bacillus. For convenience I have given it the name *B. tumefaciens*. From the salicin broth a blood agar plate was on Oct. 6th, 1918, inoculated on the surface. On the 10th a growth, apparently pure, consisting of colonies which were a little flatter than those of typical *B. welchii* was present—the symbiotic cocco-bacillus did not grow under the conditions of anaerobiosis. Films showed thickish Gram-positive bacilli and many thread and pleomorphic forms. From the blood agar plate a meat broth tube was inoculated, and in it the bacilli flourished and developed spores. A portion of the fluid was pipetted off, boiled, and added to lactose brain. In the lactose brain the spores developed, producing much acid and gas. After 48 hours numerous thick Gram-positive bacilli with central and subterminal spores were found. When transfers were made from the lactose brain into tubes containing sugars it was found that the bacillus fermented glucose, lævulose, galactose, maltose, lactose, saccharose, inulin, starch, glycerine, salicin, with the production of acid and gas. No fermentation of mannite or dulcite was manifested and there was no growth on an agar slope under aerobic conditions. From the lactose brain the culture was passed as follows —> lactose brain —> blood agar plate —> lactose brain broth —> 0·2 per cent. glucose agar shake plate culture. In glucose agar plate the surface growth consisted of a fine film, the deep colonies were characteristic and were of varied form; their shape was often reniform, often that of a whetstone, and often like the ace of hearts—the "cœurs jaunes" of Weinberg. Many of the colonies had a well-defined even edge, whilst others consisted of a meshwork of arborescent threads. The most typical colony was one with the edge well defined for part of the way round, but with a bouquet of filaments radiating from the centre and bursting through the periphery at other parts. The grenade form was very common. In short, the aspect of the colonies was such as are so well figured for *Vibrion septique* by Weinberg and Seguin [2] in Planche II. of their book. I have satisfied myself that the variation of the colony is not due to a mixture of micro-organisms. I have been able, by means of a Pasteur pipette, to take out a large colony with a well-defined and complete periphery and from it grow colonies which were mainly arborescent in appearance.

The colonies in glucose agar were found to consist of bacilli with oval spores. A colony containing such bacilli was added to broth and boiled and then planted into meat broth. The fermentative characters of the bacilli in the meat broth corresponded to those already described, and it was this meat broth tube that was the source of the bacilli used in our experiments on animals.

Animal experiments.—A full-grown guinea-pig was inoculated with 1 c.cm. of a 48 hours' meat broth culture of the *B. tumefaciens*. The injection was made subcutaneously and into the muscles of the right thigh. The animal died within 24 hours. At the post-mortem examination a large tumour was found in the right groin. The swelling consisted of a pink jelly-like mass of solid œdema; the muscles underneath contained gas and showed hæmorrhages. The abdominal wall on the affected side was reddened both inside and outside.

From the œdematous tissue, muscle and liver, bacilli having the characters of *B. tumefaciens* were recovered. The bacilli on the under surface of the liver contained some thread forms which were in length at least seven times the diameter of a red blood cell. I should mention that in the tissues as well as in culture *B. tumefaciens* is actively motile, and that it readily forms "granulose" granules, especially in lactose brain broth. Moreover, it is a little slenderer than *B. welchii*, and the ends are rounded. In glycerine broth and in some other media the bacillus is more or less spindle-shaped with pronounced polar staining. In glycerine and inulin and in lactose brain clostridial spores predominate.

On account of the rapidity with which the bacillus produces a huge œdematous tumour or swelling it seemed appropriate to give it the name *B. tumefaciens*.

Similar experiments showed that the bacillus was pathogenic to rabbits, and that Weinberg's three sera afforded some degree of protection against the immediate action of *B. tumefaciens*. One of the rabbits became paralysed in the hind limbs.

Position of the B. tumefaciens *in the Classification of Anaerobes.*

At this point I may briefly summarise the outstanding characteristics of this bacillus, so that they may be compared with those of other anaerobic bacteria of war wounds. The *B. tumefaciens* is an actively motile Gram-positive bacillus. In morphological characters it resembles the *Vibrion septique*, but it is easier to cultivate and forms spores, especially in carbohydrate media, with the utmost facility. Like the *Vibrion septique*, it often shows swollen citron forms, long threads, and "granulose" bodies.

It is essentially a saccharolytic bacillus and fails to digest either coagulated egg albumen or serum. In litmus milk it produces acid and gas. The clotted casein is not digested and remains red in colour—i.e., there is no bleaching. Spores were found in the milk culture.

The deep colonies in 0·1 per cent. glucose agar resemble those of the *Vibrion septique*. In fermenting saccharose, inulin, and glycerine it resembles some strains of *B. welchii* and differs from *Vibrion septique*, but resembles the latter in fermenting salicin. It is far more active in its action on sugars than the two strains of *B. œdematiens* with which I have compared it. In meat broth culture the fragments of muscle become pink in colour and no digestion occurs. It hæmolyses red blood cells.

I have compared the characters of *B. tumefaciens* with those of the various bacteria described in war wounds by French, German, English, and American bacteriologists, and I have come to the conclusion that I am dealing with a new species. There are resemblances between the *B. tumefaciens* and Aschoff's "Gasœdembazillus," but there are at least the following points of difference: (1) *B. tumefaciens* is actively, the "Gasœdembazillus" feebly, motile; (2) spores are more readily formed by the *B. tumefaciens* both in the animal body and in culture; (3) the lesions caused by the "Gasœdembazillus" are characterised by a clear gelatinous œdema. Those produced by the *B. tumefaciens* resemble those of the *Vibrion septique* in being hæmorrhagic.

Further study, especially of the toxin formed by the bacillus and of the agglutinins produced by it and of its response to the agglutinins specific for other bacteria, will be required to determine its position among the pathogenic anaerobes; in the meantime I think I am justified in giving it the name *Bacillus tumefaciens*.

References.—1. Vide Wilson and Steer: Brit. Med. Jour., Nov. 23rd, 1918, p. 568. 2. La Gangrene gazeuse, by M. Weinberg et P. Seguin, Masson et Cie, Paris, 1918.

Medical Societies.

ROYAL SOCIETY OF MEDICINE.

SECTION OF ANÆSTHETICS.

Exhibition of Cases.

A CLINICAL evening was held on April 4th, Dr. LL. POWELL, the President, in the chair.

Mr. ASHLEY DALY reported a case in which direct massage of the heart restored the circulation and respiration when both had ceased in the course of an abdominal operation upon a patient in a state of severe shock.—The PRESIDENT quoted a case of successful heart massage during laparotomy upon a middle-aged man with rigid abdomen.

Dr. F. E. SHIPWAY related a case in which in a feeble man of 60 collapse and heart failure ensued upon drawing the stomach out of the abdomen. Heart massage was successful in restoring the circulation.

Mr. R. E. APPERLY read notes of a case in which heart failure followed change of position. The patient was a stout woman anæsthetised with "gas and ether," followed by open ether, for laparotomy. When the Trendelenburg position was adopted pulse and breathing ceased. These were restored by artificial respiration and the horizontal posture. The operation being nearly completed the Trendelenburg position was tried again, when the same sequel of events resulted.

The PRESIDENT related a case in which "twilight sleep" and spinal analgesia were successfully employed for Cæsarean section on a woman suffering from influenza and double pneumonia.

Dr. SHIPWAY read notes of a case showing the value of oil-ether anæsthesia in a case in which a physician had advised against operation on the grounds that no anæsthetic could be tolerated. The patient had carcinoma of the stomach and had been the subject of aortic aneurysm for four years.—He also related a case of Enucleation of Tonsil in a man weighing 24 st., whose physique, huge abdomen, large pendulous cheeks and chin, and very short neck made him appear a most unfavourable subject for anæsthesia. Operation was successfully performed under anæsthesia induced by C.E. mixture and continued by warm chloroform and oxygen, bromide and morphia and atropine having been used as preliminaries.

Mr. H. E. G. BOYLE read notes of a case of Laryngofissure with Removal of Intra-laryngeal Growth performed under gas and oxygen. Morphia and atropine were used beforehand and gas and oxygen admitted through a catheter passed into the tracheotomy tube, tracheotomy having been performed under gas and oxygen, with re-breathing.

Reviews and Notices of Books

Sanitation Practically Applied. By H. B. WOOD, M.D., D.P.H. With numerous illustrations. London: Chapman and Hall; New York: John Wiley and Sons. Pp. 474. 13*s.* 6*d.*

THE object of this book is to supply information on the practical application of the principles of public health and sanitation. It is intended primarily for the use of health officers and students of public health, but the author expresses the hope that employers, teachers, and municipal officials may also gain practical directions in the art of healthy living from a perusal of its pages. Some indication of the scope of the work may be given by enumeration of the subjects treated in the 12 chapters which it contains. The headings of the chapters are as follows: the need for public health work, statistics, the control of communicable diseases, child welfare, school hygiene, pure foods, clean milk, water-supplies, sewage disposal, hygiene of the home and factory, the destruction of insects which transmit disease, and the methods which may be adopted in educating the public in sanitary matters.

The book is obviously intended for American rather than British readers, and contains relatively few references to the work of sanitarians in this country. The chapter on school hygiene contains some helpful observations on the medical inspection of school children, and that on "clean milk" is an excellent, if somewhat short, exposition on a subject which is at last receiving much needed attention in England. In reference to the standardising of milk which is practised in certain parts of the United States of America, the author gives the standards recommended by the New York Milk Committee, which briefly are as follows:—

Class A. Certified milk or it's equivalent.—The term "certified" milk should be limited to milk produced in conformity with the requirements of the American Association of Certified Milk Commissions, while the term "equivalent" indicates that produced at dairies subjected to periodic inspection and the products to frequent analyses. The cows must be properly fed and watered, be free from tuberculosis, as shown by the tuberculin test and veterinary examinations, and from other diseases or conditions liable to deteriorate the quality of the milk. They must be kept in a state of cleanliness in clean, well-ventilated cow-houses. All persons coming in contact with the milk must be healthy and free from typhoid fever, tuberculosis, diphtheria, scarlet fever, septic sore throat, and other diseases which may infect the milk. Pure water must be provided at the farm. The milk must be drawn under all sanitary precautions to prevent contamination, be immediately strained and cooled, placed in sterilised bottles, and maintained at a temperature at or below 50° F. It shall not contain more than 10,000 bacteria per c.cm.

Class B. Inspected milk.—This class includes clean raw milk from healthy tuberculin-tested cows and from dairies that score not less than 70 on the Government score card. The cows are fed, watered, and milked under good conditions. The dairymen must exercise cleanliness and be free from diseases which may be milk-borne. The milk is delivered in sterilised containers and kept at a temperature not greater than 50° until it reaches the consumer. It should contain less than 100,000 bacteria per c.cm. Pasteurisation is optional.

Class C. Pasteurised milk.—Milk from dairies not able to comply with the A and B requirements should be pasteurised, under official supervision, and then sold as "pasteurised milk." Milk for pasteurising should be kept at not over 50° while in transit to the plant. After pasteurisation it is cooled at once to a temperature of 50° or below and maintained there. No cows in any way unfit for the production of milk for use by man shall be permitted to remain in any Class C dairy. The milk before pasteurisation should contain not over 1,000,000 bacteria per c.cm., and not over 50,000 after pasteurisation. It should not show colon bacilli in 1 c.cm. It should be delivered to the consumer within 48 hours after pasteurisation. Repasteurisation is prohibited.

Class D. Milk not suitable for drinking purposes.—Milk containing over 1,000,000 bacteria per c.cm., or from farms scoring less than 40 per cent., may be allowed for cooking and industrial purposes only after being pasteurised or heated to a higher degree. It should be delivered in distinctive containers and must not be sold for drinking.

The American system of grading milk possesses many advantages. It makes farmers and dairymen keenly interested in the production of clean wholesome milk, and ensures higher prices to those who are successful in this respect. No doubt it would be preferable if all milk sold to the public reached a Class A standard of excellence, but this is not practicable under existing conditions of production, and it is very important that the public should know what they are buying, and be assured that, if they can afford the price of the higher grades of milk, they receive what they are paying for.

Dr. Wood's book contains much valuable information in a relatively compact form, and should be useful to all those interested in the practical side of hygiene and public health.

Aids to Surgery. By JOSEPH CUNNING, M.B., B.S. Melb., F.R.C.S. Eng., Surgeon to the Royal Free Hospital; and CECIL A. JOLL, M.S. Lond., F.R.C.S. Eng. Fourth edition. London: Baillière, Tindall, and Cox. 1919. Pp. 420. 4*s.* 6*d.* net.

THIS is the fourth edition of a well-known volume of the familiar "Aids" series, carefully revised and brought thoroughly up to date. The principal new feature is the addition of a description of war injuries and infections, together with their treatment under the appropriate regional headings. Compactness, a simple arrangement, and singularly clear headings combine with a terse style to make this book a valuable help in revision. As an initial text-book its value is doubtful; it lays no claim to fulfil this function. But as a rapid aid to memory it will continue to fill the place it has held in many a student's pocket.

Elements of Surgical Diagnosis. By Sir ALFRED PEARCE GOULD, K.C.V.O., and ERIC PEARCE GOULD, F.R.C.S. Fifth edition. London: Cassell and Co., Ltd. 1919. Pp. 722. 12*s.* 6*d.*

THIS book has now passed into its fifth edition with many reprints. Owing to the omission of some of the older methods of diagnosis, now fallen into disuse with the advent of X rays and other more exact means, the publication is slightly reduced in size. This is an unusual and, to students, a welcome change. There are 16 excellent X ray prints—those in the genito-urinary section being of special merit. The authors have set out to perform a great task—to initiate the student in accurate methods of examination and clinical diagnosis, and to stimulate him by demonstrating the essential value of these methods in dealing with every surgical condition. With a wealth of detail, a free use of headings and italics, and an insistence on the necessity for meticulous care in dealing with the differentiation of each type of disease or injury, they go far to attain their object.

The book will continue to be of inestimable value to the student at the outset of his clinical career—to use words employed just above. Many who have passed that stage would do well to renew their clinical youth in its pages.

An Introduction to the Study of Biological Chemistry. By S. B. SCHRYVER, D.Sc. Lond. London and Edinburgh: T. C. and E. C. Jack. Pp. 340. 6*s.*

THE chemical processes involved in metabolism form the principal theme of this book, and only one branch, but, of course, an important branch, of the study of biological chemistry is presented. The student of biochemistry must begin with a knowledge of the structure of the materials which compose the organism and the nutritional elements which maintain and build up the organism, and Dr. Schryver has been successful in giving a clear exposition of this section of his subject. The monographs on the hydrolysis of proteins and separation of the amino-acids, and on the constitution of the proteins, their classification, preparation, and general properties, form good examples of his intention. The book furnishes a very useful opening to the study of biochemistry.

JOURNALS.

The British Journal of Children's Diseases. Vol. XVI. January-March.—Dr. J. Porter Parkinson records a case of Aplastic Anæmia in a boy aged 9 years. A petechial eruption on the trunk and limbs was the first symptom, and was followed by bleeding from the gums, headache, and fever. The blood count was as follows: red cells, 1,260,000; leucocytes, 800; hæmoglobin, 20 per cent.; colour index, 0·9; polymorphonuclears, 29 per cent.; lymphocytes, 72·5 per cent.; eosinophils, 0·5 per cent. No nucleated red corpuscles; no marrow cells. The red corpuscles showed well-marked alteration in size and shape. On ophthalmoscopic examination slight optic neuritis and numerous hæmorrhages in both retinæ were found. The anæmia subsequently increased, and the hæmorrhages from the gums continued. Six weeks after the first examination the red cells had gone down to 624,000, the leucocytes were 1600, the hæmoglobin was 17 per cent., the colour index 1·4, the polymorphonuclears 28 per cent., the lymphocytes 68 per cent., and the eosinophils 2 per cent. Transfusion was performed on two occasions, the second operation being followed by jaundice, epistaxis, hæmatemesis, hæmaturia, and melæna. Ultimately complete recovery took place.—Dr. Variot and Dr. Bouquier report a fatal case of Polyneuritis following treatment by arsenobenzol for sympathetic ophthalmia in a boy aged 13. Three courses of injections had been given at intervals of three weeks. Each course consisted of seven to eight injections, an injection being given every week. The first dose of each course was 15 cg., and each subsequent injection was increased, the last being 45 cg. A painful stage was preceded by a paralytic stage in which the muscles of the extremities were chiefly affected. There was also a fine tremor present which was most pronounced in the fingers.—In a note on Recurrent Functional Micropsia Dr. John Thomson states that this is a trivial disturbance of vision which is not rare in older children and is usually only discovered by questioning as it does not cause any great distress. The child suddenly notices that the objects in the room appear smaller than usual, although the details are as clear as before. After a few minutes this passes off. The symptoms may begin at any time of the day, and occur with a high degree of myopia or with quite normal vision, with chronic dyspepsia or with apparently perfect digestion. The condition, which ceases altogether between 20 and 25, seems to depend on a passing relaxation of accommodation.—Dr. Alan Brown, Dr. George E. Smith, and Dr. John Gordon Phillips, of Toronto, contribute a paper on the treatment of chorea by intrathecal injections of the patients' own serum. Of 23 cases in children aged from 5–15 years, who were observed over a period of about 18 months, 77 per cent. were cured, 19 per cent. were improved, and 1 case showed no improvement. The average number of injections was three, but several cases required only one injection, and in one instance five were given before a cure was effected. The average amount of serum employed was 17 c.cm. 19 cases were cured in three weeks and 4 cases within one week. No recurrences took place in the course of 18 months.—The treatment of pulmonary tuberculosis in children by artificial pneumothorax is described by Dr. E. Stolkind. Six illustrative cases are recorded, and the indications, contra-indications, and complications of the treatment discussed.—The abstracts from current literature are devoted to the feeding of infants and children, nervous and mental diseases, and diseases of ductless glands.

American Journal of Public Health.—A recent number of this journal contains an interesting article by Colonel C. Lynch and Lieutenant-Colonel J. G. Cumming, of the U.S.A. Medical Corps, on the spread of influenza by indirect contact. The conclusions arrived at resulted in large measure from study of the epidemiology of influenza at certain military camps. Two methods of messing troops are employed in the American Army. In the one the soldiers use tableware or mess equipment, which, after use, is washed in boiling water, while in the other, known as "the old line method," each soldier washes his own mess equipment in water which is used by other members of the unit and generally varies in temperature between 40° C. and 50° C. The authors found that the incidence of influenza was much higher in the units which used "the old line method" than in units in which boiling water was employed for the washing of eating utensils. When the common dishwater used by troops is not kept at or near the boiling point, its bacterial content rapidly increases with the washing of each successive mess equipment. It is contaminated not merely by the micro-organisms of nasal and oral origin which may adhere to the dishes and cutlery, but also from the soldier's hands, more especially as the latter are generally used as mops when the water is tepid. The eating utensils and hands are contaminated rather than cleansed by such a method of washing. No doubt the viability of the organisms transferred from the dish-water to the knives, forks, dishes, &c., in the process of washing, may be reduced by desiccation before the next meal, but the soldier's hands, recently contaminated with the organisms from the nose and mouth of others, come frequently in contact with his own nose and mouth and may cause invasion of his respiratory tract by fresh varieties of bacteria. At one camp, where both the above-mentioned methods of messing were in operation, it was found that in a group of 977 men using tableware which was washed in boiling water, there were only 45 cases of influenza, giving a rate for the period of the epidemic of 46 per 1000, while in another group of 1860, where the "old line method" of washing the dishes, cutlery, &c., in tepid water was employed, there were 454 cases of the disease, giving a rate of 298 per 1000. At another camp, members of the officers' training school, amounting to some 5000 men, used tableware washed in boiling water, while another group of 16,364 men used the "old line method." At no time during the epidemic was the daily incidence among the former over 10 per 1000, while among the latter it reached 87 per 1000. This is the more remarkable, as the men belonging to the officers' training school were in close association with one another in crowded class-rooms, while the other troops spent most of the day in the open air. If crowding together or continuous association had been a large factor in transmission, the higher incidence should have been among troops of the officers' training school, but this was not the case; indeed, the rate of infection was five times greater among troops who led an out-of-door life.

After giving numerous other instances of their observations at camps and in connexion with military units, the authors describe certain investigations carried out at civilian restaurants. The examination of 54 specimens of dish-water from 10 different restaurants showed the average bacterial content to be 4,000,000 per c.cm.—a greater number than is found in many specimens of sewage. From the ladle of a spoon used by a streptococcus carrier, 12,000,000 organisms were isolated, many of which were streptococci. Experiment showed that a spoon contaminated with a culture of a known organism, then dried and washed with eating utensils in the usual manner, may be identified by the original contamination which has adhered to it during the washing process. It appears possible, therefore, that in civil life, as well as in the Army, eating utensils may constitute a means of indirect contact for the spread of respiratory diseases. The average individual's hands must be highly contaminated under ordinary circumstances with bacteria from his own nose and mouth, and if he be a carrier, a convalescent, or a mild unrecognised case of any one of the acute infectious diseases, his hands will certainly be contaminated with the specific virus. Many persons place the hand before the mouth when coughing, but, apart from coughing, the hand is brought in contact with the face, and particularly the mouth, at frequent intervals, and thereafter grasps such things as door-knobs, pencils, toilet articles, telephone-receivers, &c., which other people also grasp. After the saliva has become dried its distribution is limited, but, when the germ-laden saliva is moist, it is spread with great facility to conveyors and to the hands of others. The hands of typhoid carriers have been repeatedly incriminated as a means of spread of typhoid fever, and if the hand of a typhoid carrier is liable to pollution the contamination of the hand in the case of a person infected with a sputum-borne disease like influenza is much more likely to occur.

These are some of the more important matters to which allusion is made in Colonel Lynch and Colonel Cumming's instructive article. It is, of course, impossible to criticise the conclusions arrived at on the limited evidence given in the short contribution under review. It would be necessary to have details of all the other factors which might influence the spread of influenza at the camps in question, more particularly the nature of the sleeping accommodation of the different units; we must exclude their influence before accepting the authors' pronouncement on the subject as final. But the opinions expressed are very interesting, and will be useful in stimulating new lines of investigation in connexion with outbreaks of respiratory diseases.

WE have received the 1919 edition of the *Directory of District Nursing and Streets List for London*, which is issued by the Central Council for District Nursing in London. The original directory was issued in 1917, and has now been brought up to date by an extensive supplement of additional streets and corrections. It has already been found useful by a number of social workers and others, and is the only publication of its kind. In addition to the special information as to district nursing, it shows for practically every place in the metropolis, the city or borough, and the Poor-law union in which it is situated. The price is 2*s.* 6*d.* We wonder whether, in a future issue, it would be possible to include the number of the postal office of delivery for each street. This is but a small point lacking in an otherwise extremely useful directory.

THE LANCET.

LONDON: SATURDAY, APRIL 19, 1919.

The Red Cross: Past, Future, and Present.

WHEN HENRI DUNANT died in 1910 at a Swiss sanatorium, a disappointed and disillusioned old man, he little knew what was to be the development a few years later of the organisation of which he was the founder. During the war the work of the Red Cross was too breathless for self-analysis or self-realisation, and it is only now that any idea of its scope and magnitude can be obtained. On the last day of the year 1918 the executive officers of the British Red Cross—a tithe, be it remembered, of the whole Red Cross activities of the world—issued a statement that their work was approaching completion and that demobilisation was to begin with the New Year. There has now just been issued the fourth annual report of the Joint Finance Committee of the British Red Cross Society and the Order of St. John of Jerusalem, and this quarto volume[1] of 150 pages contains a stupendous record. In one sense, as the conclusion of this report runs, the end came on Nov. 11th last, when the armistice was signed. The primary work of the British Red Cross had been to mitigate the toils and distresses of his profession to the soldier of every rank at every stage of his arduous and dolorous way. In doing this over seven million pounds was spent in a single year, while the total personnel of the Red Cross last October amounted to 9234 persons, not including those serving in home hospitals or V.A.D. members who had taken some form of Government service. But centering round the care of the wounded numberless other subsidiary objects came into view, of the scope of which the mere enumeration of the auxiliary funds taken from the table of contents given in the report may give some idea:—

Transport of wounded; Motor boats; Hospital ships; Hospital trains; British Red Cross Hospital, Netley; St. John Ambulance Brigade Hospital; Red Cross auxiliary hospitals for officers; King George Hospital, London; Public Schools' hospital; Enteric hospital, Calais; Central prisoners of war; Relatives' visits to prisoners of war; Joint V.A.D.; St. John warehouse; Central work rooms; Convalescent camps and supplies committee; Thames river trips; Sundry funds; Compassionate fund; Orthopædic department; War library; Red Cross clinic; Kitchener House for Wounded Soldiers; Home expenditure (personnel); Inquiries for wounded and missing; Uniforms department; Expenses of embarkation; The Anglo-French committee.

In regard to their extent the same table tells of Commissions in France and Belgium, Egypt and Malta, Salonika, Italy, Corfu, Serbia and Montenegro, Roumania, Russia, Switzerland, Holland, Mesopotamia, and East Africa. At the same time as the British Red Cross is thus demobilising, the International Red Cross Committee in Geneva has laid down a large part of its work, including that on behalf of civil and military prisoners of war of the Allied countries, a labour of love fortunately no longer required.

But in laying down one task another and even larger is being assumed. The British report says: "But in fact the end is not yet." The Geneva Committee writes: "Au lieu de panser seulement les blessures la Croix Rouge veut remédier aux maux entraînés par la guerre." The conference representing the British, American, French, Italian, and Japanese Red Cross, which has just terminated its session at Cannes, has sketched out a programme beginning with a proposal for a permanent international bureau of health, and including schemes of activities to deal on a world-wide basis with child welfare and the problems of tuberculosis and venereal disease. The American Red Cross has already gained honourable distinction by construing its mandate so as to include French and Russian civilians. A special committee of the "big five" nations is considering how Governmental action in fighting the aftermath of famine and pestilence may best be aided by the resources, material and personnel, of the Red Cross. Dr. HERMAN N. BIGGS, of New York, would impose on the Central Red Cross Bureau the task of making a digest of the public health laws of all important countries for distribution among health authorities everywhere. Others would add an improved system of vital statistics, a universal educational campaign for child welfare, the restriction within narrow geographical limits of epidemic disease, and far-reaching schemes of housing and town-planning. Schemes for tuberculosis and venereal disease have their advocates. Sir ROBERT PHILIP, who presided over the Subcommittee on Tuberculosis, gained general assent in his suggestion of taking the scheme for tuberculosis in force in Great Britain and to a large extent in the United States, of which the dispensary is the centre and pivot of activity, as a model for further work in other countries. The Subcommittee on Venereal Diseases, over which Professor DUCREY, of Pisa, presided, endorsed Colonel L. W. HARRISON'S emphasis on the improvement of environment and the increase in home comforts as the first essentials in a campaign against these evils. Control of the use of alcohol and cocaine, compulsory notification of venereal disease, the suppression of licensed houses were other aims on which strong sectional feeling was expressed. The Child Welfare Subcommittee, over which Sir ARTHUR NEWSHOLME presided, concentrated on an ante-natal campaign of educational character. Dr. W. PALMER LUCAS spoke of the rôle of the public health nurse in the instruction of the expectant mother. Professor PINARD would like it made a legal obligation on parents to respect their unborn children. Incidentally, it may be noted, that incitement to destroy an unborn child has recently been upheld in a British court as a criminal offence.

The past has been full of work. The future is equally filled with plans and hopes. The present is terribly urgent. Welfare schemes imply human material on which to apply them. There are large tracts of Europe on which the mere existence

[1] 83, Pall Mall, London, S.W.1. Price 1*s*.

of this material is threatened. The *Revue Internationale de la Croix-Rouge*, which with the first month of the current year has become a monthly bulletin,[2] gives some account of what that misery is in detail in certain parts of Central and Eastern Europe. The International Bureau proposes to devote its efforts at the moment to finding out and cherishing the orphans of the war and to provide for their upbringing in schools and professional courses. Nothing could be more timely than the cure of childish disease and the mitigation of orphanhood, except the prevention of starvation; for it is starvation that threatens the whole childish population of Vienna, and if unrelieved there may be no children at all to grow up. The Allied Red Cross delegates are not proposing to meet the International Committee until some weeks after the signature of peace. That will be too late. Fortunately, Dr. FRÉDÉRIC FERRIÈRE, vice-president of the International Committee, is at present in Vienna, and on his report and initiative we may hope that the Red Cross will again save the situation.

The Clinical Meeting of the British Medical Association.

THE Special Clinical Meeting of the British Medical Association, which was held in London last week under the presidency of Sir CLIFFORD ALLBUTT, was an unqualified success, both scientific and social. A well advised piece of statesmanship on the part of the authorities of the Association led them to hold this meeting in lieu of the autumn scientific and social gathering; for, although peace may be said to have arrived, the normal conditions of peace, as we know too well, are not yet with us, so that the arrangement of a function of the large and usual pattern anywhere than in London would have been a matter of considerable difficulty. Nor could such an autumn meeting of the accepted type have taken advantage of opportunities now present in London owing to the sojourn in or near the metropolis of so many representatives of the medical departments of our Dominion Forces and of the United States Army, for these officers will shortly be leaving our shores. The special idea of the meeting was to bring these, our learned and gallant colleagues, into personal relations with the medical profession of the home country, to gather from them their experiences, and to make them the medium of interchange between others and ourselves for the lessons learnt at the war. The meeting was carried out in exactly this spirit, and because it was not over large it gained its particular efficiency. Many people who had met before met again, resumed their friendships, revised their opinions of each other, and interchanged views and projects without the stiffness inseparable from recent introduction. Moreover, as it happens, there are large questions of medical education, and medical reform generally, on the lips and in the minds of the medical profession at home, and these have supplied topics for discussion, apart from the actual business of the special meeting, upon subjects which cannot be looked at from too many points of view, and whose consideration should always be revised by as much intimate knowledge as can be obtained of the different circumstances in which medical men carry on their work. From these discussions many of us have received liberal instruction in sociology at many pleasant reunions.

The Special Clinical Meeting was essentially practical in its character, because the debates were opened and the various themes talked out by the actual men who had seen and done the actual things. Nothing counted except first-hand experiences—the experiences of the workers—and the broad resumptions of those experiences from men who had been placed in authority over large blocks of activity. Further, during the last four years of war every topic that came up for debate at the sections had previously been properly introduced, and in many cases closely thrashed out, by medical societies and in the medical press of the Allied countries and of our opponents. This is to say that those who attended the sectional meetings were in the position of a thoroughly well-informed committee, who had digested the agenda and who from knowledge of what had gone before were saved from the everlasting bane of committees—namely, the raising of points not germane to the discussion or already settled by common opinion. Dr. LEONARD DUDGEON'S résumé of our knowledge of the dysenteries, bacillary and amœbic, was founded on work done by himself and a group of co-workers, and to his introductory address on the subject Professor W. YORKE made a notable addition by his special references to the importance of carriers and the chances of the disease becoming endemic in this country. The debate on this address brought into something like logical sequence the results of greatly varying pieces of work. Almost the same words might be used of the address with which Dr. F. W. MOTT opened the discussion on War Neuroses, to which we referred at some length last week. The discussion on Dr. MOTT'S paper was followed by interesting contributions from Dr. A. F. HURST and Dr. E. F. BUZZARD, and from the views of these, and other speakers highly competent to form opinions, a graphic picture of war neuroses emerged, as we believe our readers will agree when this section is reported next week. Professor W. M. BAYLISS in the Section of Surgery opened an extremely interesting discussion on Wound Shock, to which Sir ANTHONY BOWLBY, Dr. H. H. DALE, and others made valuable contributions; the whole subject of surgical shock—its true physiology and neurology, and the physical factors that lie beneath the conditions—was gone into in a manner which cannot fail to be useful to future workers. In a similar way the prominent phenomena of malaria, venereal disease, influenza, and cardiac disorders came under notice, with the result that there is placed before us a large amount of scattered information bearing on every aspect of these widespread scourges, and this in such a way that general inferences can be drawn for our guidance.

[2] Musée Rath, Genève. Price 20*s.* annually post free.

The result of the debates at the sections will, in fact, form a brief interim report on the pathology of the war. It must be many years before the true lessons of the war, as they should make for the progress of all medicine, will really be accessible to us; a vast amount of collating and sifting lies ahead. Reconciliation of apparent discrepancies will follow on a more intimate knowledge of circumstances, and phenomena will be placed in their right importance, sometimes with the result that things which have been casually and cursorily noticed will be found to contain promise of the most important developments. The ultimate medical history of the war is a feast for the future, of which the Special Clinical Meeting of the British Medical Association is a foretaste, giving, we may add, a direct contradiction of the hoary old proverb that you cannot eat your cake and have it. The lessons of the Special Clinical Meeting form a slice of the future cake—and a good large slice; but the result of eating it will be, that by as much as we digest it, by so much more noble will the cake of the future be. It will be larger through the added knowledge of the workers, and more acceptable through the improved powers of appreciation possessed by the consumers.

Annotations.

"Ne quid nimis."

THE OPENING-UP OF THE CHEST.

IN the body politic there are backward areas in which modern ideas are unknown, or if known are accepted with hesitation and anxiety. The same has been true of regional surgery, and in 1914 the chest was a region of the body in which the surgeon had not dared to put into practice principles long accepted for most other regions, including of late the abdomen. The war has let abundant light and air into the chest, and the surgeon has learned to follow without faltering in the track of the projectile. In the old days a pulmonary hæmorrhage into the pleura was allowed to proceed, unchecked by operative interference, until nature arrested the flow. This treatment by rest and strapping grew out of the South African War, where most wounds were due to rifle bullets, and most infections, springing as they did from the soil of the open veldt, were small and mild in their nature. Very many of the wounds in France were caused by shell fragments; the battlefield was invariably manured and cultivated ground swarming with virulent bacteria. It is not to be wondered at that the treatment which had survived successfully the war in South Africa should be a miserable failure under these new conditions.

The discussion on Gunshot Wounds of the Chest, introduced by Colonel T. R. Elliott and Colonel G. E. Gask at the recent clinical meeting of the British Medical Association, shows that, except for the deaths occurring within a few hours of injury from shock and loss of blood, the fatal issue of modern chest (as of other) wounds is almost always due to sepsis in one form or another. Where death does not occur there is generally prolonged illness, often due to empyema and its sequelæ, and always attributable to some septic process. In these circumstances it is clearly the surgeon's duty to excise the wound and then to close it, just as he would excise and subsequently close a wound in the soft parts. The operation should be performed as soon as possible after recovery from shock has taken place, when there is but little risk of the infection having spread beyond the immediate neighbourhood of the wound. The wound of the soft parts should be first excised, and this will include the removal of sharp broken portions of the ribs and scapula; then the pleural cavity must be cleansed of blood, and if any hæmorrhage continues the wounded vessels must be tied; any fragments of shell must be taken away and any portions of the clothing that have been driven in. When the lung itself has been wounded the damaged portion of the lung should, if possible, be excised as well. The lung should in all cases be sutured and the pleural cavity must be closed. Sometimes it is possible to do all that is needed without opening the chest extensively, but in other cases it may be necessary to resect one or more ribs in order to obtain a sufficient access to the interior of the pleural cavity. Finally, it is of the most vital importance that however little or however much has been done, the wound of the chest wall shall be closed, otherwise infection will certainly occur. It is worthy of notice, too, that the patient appears greatly relieved by the closure of the chest wall. When the wound is sutured healing will generally occur by first intention. It is now fully recognised that the healthy tissues of the body are capable of dealing with a certain amount of infection so long as fresh infection does not occur; a drainage-tube, on the other hand, offers free passage to an unlimited number of extraneous organisms, and before such a continued invasion the tissues are helpless. The application of well-established surgical principles to the chest has opened up a new region in which civil surgeons will continue to work.

ANTIPLAGUE SERUM IN INFLUENZA.

MUCH interest has been aroused in France by a communication on the ætiology of influenza made to the Académie des Sciences early in February by Dr. Eugène Folley, whose paper appears on p. 656 of our present issue. This worker cultivated from an accidental rat-bite of his own hand a bacillus resembling *B. pestis*, the rat having been experimentally infected with influenzal sputum. The bacillus was identified at the Pasteur Institute as one of the "pasteurella" group, which includes the bacilli of hæmorrhagic septicæmia and of chicken-cholera, bacilli which are potentially pathological only if their virulence is raised by animal passage. Dr. Folley subsequently went through a typical and severe attack of influenza, and was treated with antipest serum, this being the nearest approach to specific therapy available. He rapidly recovered. He himself treated 500 influenza patients in the same way without one dying, and, moreover, grew the cocco-bacillus from the blood of most of these in the cold incubator. Dr. Folley's claim amounts to having identified the veritable cause of influenza. His communication has been widely bruited in the French lay press. An organism similar to that described by Dr. Folley has, we understand, been cultivated in this country under similar circumstances from influenza cases. Nevertheless, the filter-passer described by Sir John Rose Bradford and the late Major Graeme Gibson remains the

most likely cause of the disease, and the plague-like bacillus is probably only a secondary infection. It may, on the other hand, be an alternative phase of the filtrable virus. The use of antiplague serum is perfectly rational in such cases and is worth further trial. Dr. Folley is to be congratulated upon his logical pursuit of specific therapy, as also upon his interesting clinical records.

THE ADAPTATION OF TOOL HANDLES TO CRIPPLED HANDS.

IN the *Medical Record* of Feb. 15th Major R. W. Shufeldt has described a device which should be a boon to the large number of men who now have a crippled hand. It is due to the ingenuity of an American orthopædic surgeon, Major R. H. Allen. After the healing of certain wounds of the hand complete flexion of the fingers is impossible, a "fist" cannot be made, and the grasp is practically useless. It may be impossible to pick up a tool because the hand cannot close on the handle, but if the handle is adapted to the hand grasp is restored. Major Allen accomplishes adaptation by means of the "composition" used by dentists for taking impressions. A sufficient quantity is softened in hot water until it becomes plastic, and is then applied to the handle of the tool. The injured hand seizes the soft mass and presses into it as much as possible. The tool is then released and the handle with the mass on it plunged into cold water. This sets the mould, and the patient can then readily grasp the tool. With use the grasp becomes closer and stronger. The mould can then be readily altered by the patient. All that is required is to dip it in hot water and, without detaching it from the handle, squeeze it until a well-fitting, comfortable handle is formed, and harden this by immersion in cold water. In order to exercise the injured hand a mould of it is made by closing it upon a mass of gelatin of the proper consistence and setting this aside for a time. The mould may be carried about in the hand without attracting much notice. Constantly squeezing and releasing this resilient mass help to restore the usefulness of the hand. By Major Allen's device crippled hands have been enabled to do such things as use a fork, a chisel, and a saw, and the method, he holds, can be developed in another direction. In the manufacture of artificial arms there is great difficulty with the hand, which is often complicated and easily gets out of order. A "hand" holding a fork may be moulded in the manner described above. When it is desired to use something else the "hand" may be plunged into hot water, the fork removed, and a pencil, pen, or other article inserted and fixed by plunging the "hand" into cold water.

PITUITARY HEADACHES AND THEIR CURE.

ATTENTION is directed by Dr. I. H. Pardee in the *Archives of Internal Medicine* (February, 1919) to headaches the result of pituitary disorders. Characteristic of this type of headache is its frontal distribution and its intractability to the ordinary remedies. The cause is held to be due to an enlargement of the hypophysis following on a demand made upon it or attributable to disease of the gland. Roentgenograms made of these cases of pituitary headache show a wide variety of sellæ turcicæ. There may be a very small contracted fossa with the clinoids in apposition or a large fossa with a similar formation of clinoid processes. Or there may be erosion of the posterior clinoids, or even of the anterior processes, with visual changes. Pituitary headache has three characteristics: its location, its duration and persistence, and its relief under specific medication. It is described as being deep in the forehead behind the eyes, with tightness between the temples, and a feeling of pressure or distension. The headache lasts from half an hour to 48 hours; there may be exacerbations. At the climax of the headache there may be vomiting followed by relief. It is interesting to note that the ingestion of sugar, for which in these cases there may be a great craving, increases the headache; this is attributable to anomaly of sugar metabolism due to the pituitary disorder, this gland being intimately related to sugar metabolism. Patients subject to these pituitary headaches may show certain general indications of pituitary dystrophies. The hair is apt to be coarse and dark. There may be alterations in the bony framework; eyes too close together or too far apart; prognathism of the lower jaw, or general coarseness of the features. Blood sugar determination and sugar tolerance may show either too high or too low a figure. Marked relief of the headaches is claimed to follow pituitrin medication, 1 gr. three times a day (Armour's tablets). Within a few days there will occur a decrease in the intensity of the headaches. Too long continued pituitrin is inadvisable. Brief reports of seven cases are given in which benefit certainly appeared to follow this treatment.

BOULOGNE AS A MILITARY MEDICAL BASE.

TO many in this country Boulogne-sur-Mer was, even before the war, as well known as Folkestone-on-Sea, at the other end of the short sea crossing. The part it has played in the events of the last few years has made the French seaport a place as familiar as his native town to hosts of our men, and especially to the members of the Royal Army Medical Corps. Lieutenant-Colonel Guy N. Stephen, R.A.M.C., in his "Notes on the History of Boulogne as a Military Medical Base," appearing in the February issue of the *Journal of the Royal United Service Institution*, claims for Boulogne associations longer and more potential than those of any other of the seacoast towns of our French Ally. In this first instalment of his article the author describes the site of the town, its port, roads, and railways, together with its geology, and begins his story with the landing of the British Military Base from Southampton less than a week after the declaration of war on August 4th, 1914, the first officer to put foot on shore being Colonel E. H. Lynden-Bell. This officer was invalided home early in 1915, received a C.B. for his services, and subsequently became officer in charge of the R.A.M.C. Records. The site selected for the stationary hospital was a large farmhouse known as the Jesuits' College, and on August 13th the first medical unit of the Expeditionary Forces arrived—namely, No. 2 Sanitary Section, under the command of Major R. B. Ainsworth, R.A.M.C., D.S.O. This was followed by No. 2 Stationary Hospital under the command of Major W. L. Steele, R.A.M.C., C.M.G., on the following day, but the activities of the base did not, at this time, last more than a fortnight, for owing to the success of the German operations in Flanders the town was rapidly evacuated. The last unit to move out was that which had been the first to arrive—namely, No. 2 Sanitary Section. We look forward with interest to the completion of Colonel Stephen's account.

DECENTRALISATION AT THE MINISTRY OF PENSIONS.

THE reorganisation of the Ministry of Pensions will affect the large and growing number of medical men who have to do with crippled and disabled pensioners. The Minister, Sir L. Worthington Evans, is introducing important modifications into the present scheme of pensions administration. It has been found that the local war pensions committees are too far removed both geographically and otherwise from the central authority. He therefore proposes to set up 13 regional offices, each under the control of a director aided by a regional advisory council and having five separate branches, to deal with different aspects of the work. The medical services branch will be in charge of a Commissioner with medical staff and inspectors. The local committees will thus communicate with their local regional headquarters in matters of treatment or of curative training and with regard to medical boards and referees, instead of dealing, as now, directly with the central London offices. This is a measure of decentralisation which should conduce to efficiency.

THE annual oration of the Medical Society of London is to be delivered by Sir John Tweedy on Monday, May 12th, at 9 P.M.

THE Fellowship of Medicine is arranging for a definite course of daily lectures and demonstrations at No. 1, Wimpole-street, London. As soon as sufficient applications have been received a detailed programme will be published and sent to applicants.

Sir Arthur Newsholme has left for America where he is to review the child welfare campaign. We understand that he has been offered the chair of Public Health at the University of Baltimore and that he will probably accept the offer.

THE postponed Lettsomian lectures of the Medical Society of London will be delivered by Dr. William H. Willcox, Colonel, A.M.S., on Monday, April 28th, Wednesday, April 30th, and Friday, May 2nd, at 9 P.M. The subject of the lecture is Jaundice, with special reference to types occurring during the war.

DEMONSTRATIONS will be given in the theatre of the Royal College of Surgeons of England by Professor Arthur Keith, the Conservator of the Museum, at 5 o'clock P.M., on Fridays, April 25th, May 2nd, and May 9th. These demonstrations will be open to medical students and practitioners, and first-aid and ambulance students, desirous of attending, will also be admitted. The subjects are as follows:—April 25th: Gunshot Injuries of the Skull and their Sequelæ; May 2nd: Gunshot Injuries of the Bones and Joints of the Lower Extremity; May 9th: Gunshot Injuries to the Pelvis and Pelvic Viscera.

POLICE MEDICAL SERVICE.—The Home Secretary has appointed a committee to inquire into the organisation of the medical service provided for the Metropolitan Police. The members of the committee are: Sir Hamar Greenwood, M.P., Major H. Barnes, M.P., Sir William Watson Cheyne, M.P., Mr. J. F. Moylan, Dr. J. Sinclair, Major-General C. S. Wallace, and Mr. F. C. Johnson, secretary.

BRITISH MEDICAL ASSOCIATION:

SPECIAL CLINICAL MEETING.

THE Special Clinical Meeting of the British Medical Association, replacing the usual annual meeting in August, began its session on Tuesday, April 8th, the time being chosen with a view to securing the attendance of the many medical officers on service with the Overseas and American Forces.

Reception at the Guildhall.

Sir Clifford Allbutt, President of the Association, and Dr. M. G. Biggs, President of the Metropolitan Counties Branch, received a representative company at the Guildhall on the evening of Tuesday, April 8th. It was a pleasure to see amongst the guests so many members of the American Medical Service; it was evident, too, that they thoroughly appreciated the occasion, whether one met them dancing in the Art Gallery or discussing with Major McAdam Eccles the interesting specimens exhibited in the Great Hall. Mr. G. Q. Roberts, secretary of St. Thomas's Hospital, lectured on "Old London" to audiences that the New Court Room was barely able to contain. His lecture was illustrated by lantern slides showing maps and drawings of London scenes from Roman times down to the present day and was enlivened by several good stories. Dr. A. C. Dove conducted parties through the Guildhall and Museum, explaining points of artistic and historical interest. Music was provided by the string band of the Royal Artillery in the Great Hall and afterwards in the Art Gallery. There were two consecutive concerts in the Council Chamber.

The Fellowship of Man and the Fellowship of Medicine.

Sir John Goodwin's address at the Royal Society of Medicine to an audience including a large number of American visitors to the British Medical Association meeting may not unfairly be brought into relation here with the official doings of the Association. He dealt freely and in humorous vein with the revelation of human nature on the battlefield; the varying moods of excitement, anger, calm, and lust for vengeance; and the numerous conditions of danger and hardship. In such an atmosphere the officer got to know his men and the men got to understand their officers, all his weaknesses and peculiarities being unerringly laid bare. The principles which should guide the officer in his relations with his men were, he said, broadness of mind, a sense of absolute justice and impartiality as well as of loyalty to the men under his command. Commenting on that subtle state of mind which for want of a more satisfactory term we label "reaction," Sir John Goodwin said that he had observed that men who for weeks together in the trenches would undergo the most terrible hardships without complaint would, when brought to billets and provided with comfort and entertainment, show annoyance on being offered the same kind of jam for five days in succession. Similarly, many people at home who had stood the four years and a half of war without murmuring, expected perfection in life to be attained by the stroke of a pen. But the differences at present existing between groups of men and between nations were only skin-deep, and the war had, he hoped, acted as a reconciling influence for all time. He wished the Fellowship of Medicine, with its home at the Royal Society of Medicine, a successful future, and reminded his hearers that the military hospitals were now open to them and that every facility would be offered to them for acquiring experience and knowledge.

The arrangements of the meeting did not allow for the delivery of a presidential address, but Sir Clifford Allbutt communicated to the *British Medical Journal* of April 12th some impressive thoughts on the New Birth of Medicine in lieu of a formal address. Meetings of the three sections opened at 10 A.M. on Wednesday, April 9th, the afternoons being occupied by clinical and pathological demonstrations.

On Wednesday afternoon, from 4.30–6 P.M., the President of the Royal College of Surgeons of England entertained the members of the Association to tea at the College, when there was an exhibition of Hunterian and Listerian relics.

In the evening Sir Clifford Allbutt entertained certain of the prominent organisers of the meeting to dinner at the Athenæum.

The Popular Lecture.

An entertaining lecture was given at the Queen's Hall, Langham-place, on the same afternoon by Major-General Cuthbert Wallace, A.M.S., speaking from his rich experience as a consulting surgeon to the Expeditionary Force, who told the story of the evolution of the casualty clearing station, illustrating his remarks by lantern slides. Sir John Goodwin presided. The casualty clearing station owed its origin to the South African campaign, in which the field hospitals became immobile owing to the congestion of sick and wounded. Providing accommodation at first for 200 stretchers, 20 beds were then added to the equipment and emergency surgery performed, while in the next stage the employment of nurses made possible surgery of a higher order at the "C.C.S." The dental surgeon was a later and extraordinarily successful addition. General Wallace paid a warm tribute of praise to the regimental medical officer. His duties, he said, never ended morn, noon, or night; his influence on the morale of the front line of the Army had been incalculable; the men were inspired by the sight of the doctor moving about among them, knowing that if they were wounded they would be properly cared for. We had had too few of these officers. At the first great British offensive at Loos 13,000 men were wounded on the first day, and the total was about double the number of patients found at any one time in the large hospitals of the metropolis. Before the battle of the Somme in 1916, when there were 23,000 wounded on the first day, many improvements had been made in the organisation of the clearing station and medical teams were available, consisting of surgeon, nursing sister, and orderlies with anæsthetics. The Somme also saw the rise of chest surgery, which was likely to have its influence upon civilian practice. At the battle of Hill 70 in 1917, when the wounded numbered 4157, 20 of these surgical teams were at work, as compared with 16 teams for the 13,000 casualties at Loos. There had, however, throughout been a lamentable lack of surgeons, and when the Armistice was signed only 5683 medical officers were available in France, though at one time there had been 1000 more, the losses from the ranks not having been made good. It was not, however, surgery, General Wallace generously added, that had been the miracle of the war, but the health of the troops as a result of the labours of the sanitary service. There had been fewer cases of typhoid during the whole of the Great War than there had been deaths from typhoid in the "little" South African War.

Lieutenant-General Sir Charles Burtchaell, head of the medical services in France during the last stages of the war, supplemented General Wallace's eulogy of the medical department of the Army. The history of the clearing stations was intimately bound up with the progress of medical and scientific knowledge of the war, and this progress, he said, had been rendered possible by the ready assistance of the leaders of the civil medical profession and by the moral and financial support of the State. The British Red Cross Society and the Order of St. John had provided material not available from ordinary army sources, while the Medical Research Committee had given inestimable help in recording, elucidating, and investigating conditions of pressing importance. General Wallace himself had, he said, been one of the foremost in the effort to improve the surgical methods of treating gunshot wounds and in rendering easier the lot of the wounded.

Reception at the Royal Society of Medicine.

On Wednesday evening Sir Humphry Rolleston, President of the Royal Society of Medicine, received the members of the Association and other guests in the library of the Society's House at 1, Wimpole-street. The occasion was one of marked social success, and the library and other reception rooms were thronged with groups of animated talkers until a late hour. The exhibition of valuable books and manuscripts from the library cases was an evident attraction to large numbers from overseas. Cinematograph films of pathological subjects, instrumental and vocal music, added to the attractions. A body of medical men and women infused with new ideas and enthusiasms, thoroughly enjoyed the hospitality of the Society.

On Thursday afternoon, at 4.30 P.M., the President and officers of the Royal College of Physicians of London held a reception at the College, a collection of portraits and rare books being shown. Sir Humphry Rolleston delivered on this occasion the third Lumleian lecture, which appears at length in the present issue of THE LANCET.

In the evening members of the Association and their friends dined together at the Connaught Rooms in Great Queen-street.

The Editor of THE LANCET entertained at lunch representatives of the Clinical Meeting and others connected officially with medicine at the Hyde Park Hotel on Friday.

The Exhibition.

Not since the outbreak of the war have medical men had the opportunity of viewing a collection of surgical instruments, hospital appliances, drugs, foods, and other novelties of professional interest such as that arranged at the special exhibition which was held on the second floor of the College of Science and Technology. British industry, enterprise, and skill found a pleasing illustration at many of the stalls, notably where attractive specimens of synthetics, alkaloids and their salts, laboratory glassware, anæsthetics and oxygen apparatus were shown. Many of the exhibits formed examples of medical accessories demanded in very considerable quantities by the naval and military medical services during the war. The exhibition presented a very interesting series of objects, evidencing in important directions the admirable response made to unprecedented demand. A further feature of the exhibition was the display of literature on war surgery and medicine, including some remarkable X ray photographs. Some new hospital appliances, operating tables, beds, nursing trolleys, the introduction of which for the most part arose out of the events of the war, formed also an interesting section of the demonstration.

Section of Medicine.

The report of this section, including the discussion on influenza held in common with the Section of Preventive Medicine, is held over until our next issue.

SECTION OF SURGERY.

At a meeting held on Wednesday, April 9th, with Sir GEORGE MAKINS in the chair,

Colonel T. R. ELLIOTT opened a discussion on

GUNSHOT WOUNDS OF THE CHEST.

He said that the immediate anatomical results of a wound perforating the chest were the splintering of the ribs inwards and outwards, the laceration and bruising of the lung around the track of the missile, and the effusion of blood to form a hæmothorax within the pleural cavity. With regard to the reaction of the lung itself to the wound and to the presence of the subsequent hæmothorax or pneumo-hæmothorax, the lung tissue might be infiltrated with blood for a considerable distance around the wound track, but the lung was so elastic that it did not fissure and rarely showed contrecoup injury at a distance from the wound. The changes in the pulmonary circulation were probably only those associated mechanically with the hæmothorax, for the lung vessels lacked a powerful vaso-motor innervation. There was reason to suppose that the bronchial musculature played its part in many reflex reactions to injury, its main purpose probably being that of protecting the elastic tissue of the air sacs from harmful over-distension. If this musculature was thrown into strong contraction throughout the lungs as the usual reflex reaction to a chest wound, cyanosis and dyspnœa would result, a reaction which was generally observed. Rest for the wounded man and morphine helped to allay this difficulty of breathing, and in a few hours he had generally regained a fair colour and would stand an operation well. Occasionally the cyanosis and discomfort persisted, and patients in such a state stood an operation on the chest very badly. The respiration was shallow and quickened, with a small air current. On the injured side the intercostal muscles showed an increased tone, while their respiratory rhythm was often lessened to almost complete immobility. The rhythmic movements of the diaphragm were lessened, too, but the tone of the muscle

did not seem to be increased, for the X rays a few hours after the wound showed that it was in a position of extreme elevation.

Hæmothorax.

The outstanding characteristics of a hæmothorax were the elevation of the diaphragm, the small size of the chest, and the tendency to partial or complete collapse of the lung in any area; while later the part of the lung on the wounded side which was not submerged in the hæmothorax showed an unusual compensatory emphysema. The lung tended to be small on the wounded side, and to collapse everywhere. He referred to the view expressed by Sir John Rose Bradford in his recent paper in the *Quarterly Journal of Medicine*, but said that the lung itself had its physiological reflexes, and was not a passively elastic bag. The smallness of the lung might be equally explained by an associated constriction of the bronchiole muscles cutting off the diminished air current from the alveoli, and by the diminution of the air current which resulted from the lessened inspiratory activity of the external muscles of respiration. Once these conditions were established the air in the air sacs was rapidly absorbed into the circulation, and large areas of the lung might be completely deflated. General massive collapse of the lung on either side after a chest wound was rare, and was a contra-indication to early operation. The view that to his mind embraced the whole state was that of a general reflex bronchiolar constriction, which prepared the lung for collapse when the external respiratory movements were inadequate. And this theory might be used to explain the excessive emphysema, with its skodaic phenomena, that developed subsequently in a lung above a hæmothorax; for it might be assumed that the preliminary constriction of the bronchioles was followed by a phase of extreme relaxation which might favour the development of emphysema. A large hæmothorax should be removed as completely as possible and at the earliest date. When the hæmothorax was chiefly fluid and with little clot an early aspiration would suffice, and the lung re-expanded almost at once. Thoracotomy for evacuation of a large hæmothorax should be performed very early if it was to give a useful result, and excellent results could in most cases be obtained by simple aspiration. Early aspiration must be the routine, and if this was found to fail by reason of clot, the chest must be evacuated at the earliest possible date by thoracotomy without drainage.

The urgent problem with chest wounds in this war had been always that of checking the spread of infection which was carried into the wound in so large a proportion of the cases. This was the problem that surgery did at last solve. The thoracic wall was now closed and repaired by early operation, and the success of such measures often prevented infection from creeping inwards to the pleural cavity at a later date, as it used to do, particularly in the form of a dangerous streptococcal invasion.

Surgical Aspects.

Colonel G. E. GASK read a paper on the Surgical Aspects. He said that nearly 100 per cent. of all wounds were contaminated, and there was a period of some hours between the time of contamination and infection. If infection was allowed to take place the wounded man ran the risk of death or prolonged illness from septic processes. Antiseptics by themselves were of little value in preventing sepsis. The correct treatment, whenever practicable, was to excise the wound in the latent period between contamination and infection, removing foreign bodies of all kinds. After this complete mechanical cleansing the wound should be closed and the patient kept at rest. If this method could be applied the percentage of healing by primary or delayed primary union was very high, and much needless death, suffering, and disability were saved.

The mortality from chest wounds was high. The fatal cases fell into three main groups: 1. Deaths a few hours after admission to a casualty clearing station, generally due to extensive and severe injuries, combined with loss of blood and shock. Few only of these cases could be saved, though with the aid of improved resuscitation methods and transfusion of blood the percentage improved. 2. Deaths two or three days after the injury, almost always due to sepsis of the pleural cavity and its contents. 3. Deaths at the base, of which sepsis again was almost the invariable cause.

Channels of Infection.

The pleural cavity might be contaminated: 1. By the missile and portions of clothing or equipment carried in with it. In-driven splinters of rib were a factor both of causing and maintaining sepsis. 2. Through the wound of the chest wall. 3. From the wound of the lung itself in which the missile, bone, or piece of cloth might be retained. The duty of the surgeon was to (1) arrest hæmorrhage when necessary; (2) resuscitate collapsed cases; (3) when required, to cleanse the wound of the chest mechanically.

Types of Chest Wounds.

Chest wounds presented themselves to the surgeon in the following categories: (1) perforating or through-and-through bullet wound; (2) perforating or through-and-through shell wound; (3) penetrating wound with retention of large missile; (4) penetrating wound with retention of small missile; (5) open thorax; (6) tangential parietal wound; (7) thoracic wounds complicated by injury of the abdomen or spine or by multiple wounds. Rifle bullets usually made a through-and-through wound, with small entrance and exit holes. Such cases very often got well of themselves. Shell wounds, on the other hand, were far more dangerous. The fragment entering carried with it portions of clothing or equipment, which lodged in the pleural cavity or contents. At the same time splinters of bone were driven in and might be found scattered along the track of the missile. Collapse of the lung was almost invariable. Bleeding at first was free, for a hæmothorax was almost always present. Study of the pathological anatomy of chest wounds showed us, therefore, that they had the same characteristics as other battle wounds. Before infection had occurred the dead and dying tissues should be cut away, the foreign bodies removed, the blood cleaned out of the pleural cavity and the chest closed, and in a great majority of cases healing would be by primary union; the wounded lung would expand, and normal function be restored early.

The clinical appearances included initial distress, hæmoptysis and shock, which might be due to the severity of the wound, loss of blood, pain, upset of respiratory and circulatory mechanism, cold and fatigue, or jolting in transport.

Principles of Treatment.

When a patient was admitted suffering from a chest wound he should be put to bed and allowed to rest undisturbed for one or two hours to recover from shock, except when (*a*) there was active bleeding, or (*b*) a sucking wound. Later a survey of the whole patient must be made and all wounds examined. Radiography was of the greatest importance, for with its aid valuable information could be gained concerning (1) the position and size of a foreign body; (2) the existence and size of hæmothorax and pneumothorax; (3) the condition of the opposite lung, cardiac displacement, and movements of the diaphragm. All the approved methods of resuscitation must be used in order to bring the badly wounded up to such a condition that they could stand operation. Indications for early operation were: 1. A ragged wound of the soft parts. 2. Compound fracture of the ribs. 3. Continued bleeding, whether from the inside or out. 4. Suction of air into the pleural cavity (open thorax). 5. Retention of a large foreign body. 6. Pain—out of proportion to the apparent severity of the injury (often the result of indriven splinters of bone scratching the lung with every respiratory movement). 7. Rapidly increasing pneumothorax, due to a valve-like opening into the pleural cavity. When none of these indications were present—that is, when the wounds of the chest wall were small and clean, when the foreign body retained in the lung or mediastinum was small and there was little likelihood of septic changes—the patient might be treated on general medical principles.

Treatment by operation.—The best time was as soon as possible after the patient had recovered from the initial shock. Patients bore operation well and took a general anæsthetic satisfactorily. The form of anæsthesia was not of great importance as long as it was administered skilfully. The objects to be aimed at were: (1) Excision of the wounds of the softs parts; (2) excision of the broken bones—ribs or scapula; (3) cleansing of the pleural cavity from blood, missile, indriven fragments of bone, or clothing; (4) excision (when possible) of the damaged area of lung; (5) suture of the lung; (6) closure of the thoracic cavity.

Colonel Gask discussed the operative procedures under these headings.

Application of War Lessons to Civilian Practice.

He then spoke of the lessons learnt in military service which might be applied to civilian practice. The subject was one deserving careful consideration. Crushed or "stove in" chests occurred in civilian practice. When associated with severe laceration of the lung by indriven fragments of bone thoracotomy might be of service. Could we make use of thoracotomy for the cure of intrathoracic carcinoma of the œsophagus? Dr. Willy Meyer, of New York, with whom he had spoken on this subject, was not very hopeful on this question, and he issued a very urgent warning, believing that the condition of patients wasted by malignant disease of the œsophagus rendered them much more dangerous subjects for thoracotomy than the vigorous soldiers who were operated upon in France. Dr. Meyer's warning deserved careful consideration. Could we improve the treatment of empyema? In certain cases, particularly of children with a pneumococcal empyema, the pleural cavity might be washed out and the chest closed without the use of a drainage-tube. This method had been performed successfully, and his belief was that in suitable picked cases it might prove beneficial.

Discussion.

Major J. E. H. ROBERTS said that when cases could be treated carefully the results were good, but during a time of stress, and where the surgeon's experience was limited, the results were unsatisfactory. He objected to the method of expanding the lung artificially, as septic material might be driven into the other lung and set up septic pneumonia.

Major LOCKWOOD said that he had seen the mortality in early cases reduced from 100 per cent. to 28 and 34 per cent. When the missile in the lung was not large it should be left. Local anæsthesia diminished the risk of shock.

Colonel BARLING thought that operation shortened the period of convalescence. A small number of cases running a mild course might be selected for primary suture.

Colonel A. B. SOLTAU was doubtful about the results of surgery. He thought there were no clinical signs of bronchial spasm, and suggested that the condition might be due to paralysis of the muscles controlling respiration. Painful tonus of the abdominal muscles was often found on the affected side, and might be regarded as an effort of nature to enable the lung to close down and arrest hæmorrhage.

Sir JOHN ROSE BRADFORD spoke of massive collapse, which might last for a considerable time without causing trouble. There was no explanation of it at present.

Miss FRANCES IVENS had had experience of 166 cases, with a mortality of 9 per cent. The most successful cases were those in which complete and early operation was done on the lines indicated by Colonel Gask, with closure of the wound. Some had developed empyema, and these she had irrigated by the Carrel method till a bacteriological report was negative. When anaerobic organisms were present she combined large doses of anti-gangrene serum with the same treatment.

Mr. MAYNARD SMITH spoke of the improved condition of the wounds after the practice of roughly suturing them at the field ambulances was adopted.

Dr. N. S. FINZI described the work of the radiologist in these cases, and gave a radiographic demonstration of various conditions found in chest injuries.

Sir ANTHONY BOWLBY had no doubt of the improvement which resulted from operation, but sometimes unsuitable cases were operated upon. He was anxious to learn the later effect of large and complicated hæmothorax.

Colonel J. W. SMITH gave his experience at home of the later condition of cases with retained foreign bodies in the lungs. He thought that in most the discomfort and disability were not great, and he did not advise removal of the projectile.

Sir BERKELEY MOYNIHAN said that he had been led to operate on patients with projectiles in their lungs on account of their complaint of pain, disinclination for active exertion, and sometimes hæmoptysis. The lesson he learnt, however, was the advisability of freeing the lung from its embarrassing entanglement of adhesions. When this was done the condition greatly improved.

Sir GEORGE MAKINS said that with regard to the question of bronchial spasm in collapse, he would suggest that the state of vascular stupor, so well recognised in the limbs, might be reproduced in the conditions of the pulmonary vessels in chest wounds. He was doubtful if a simple hæmothorax of moderate size should necessarily be treated by operation.

WOUND SHOCK.

A meeting was held on April 10th, with Sir ANTHONY BOWLBY in the chair.

Dr. W. M. BAYLISS, professor of general physiology in University College, London, opened a discussion on Wound Shock. He said that although the state of wound shock was readily recognised it was difficult to define it in such a way as to distinguish it from other somewhat similar conditions, and particularly from the results of hæmorrhage. Whatever might be the nature of the causes which brought about the serious state of general collapse there was no doubt that several factors usually combined—hæmorrhage, toxic products from injured tissues, cold, fatigue, &c. The final result was the same, whether hæmorrhage alone or shock without hæmorrhage were present, and this was a deficiency of blood in circulation, which usually showed itself by a low blood pressure. After hæmorrhage there was an actual loss of blood; in the other case the blood was held up in the tissues and was also diminished in volume by loss of plasma through the capillary walls, which had become abnormally permeable from defective blood-supply. The defective supply of oxygen to the tissues led to degenerative changes of various kinds, which, in their turn, resulted in exaggeration of the condition by further diminution of the inflow into the heart and a greater fall in the blood pressure. This vicious circle must be broken by increasing the fluid in circulation and ensuring a better supply of oxygen to the tissues.

If blood were actually lost from the body the object of an intravenous injection was to keep up an adequate supply to these tissues until new blood corpuscles had been formed by the bone marrow. Where the deficiency was due to stasis in the capillaries the object was to bring about a good blood current, so that the blood out of use might be carried back into currency and the capillaries recover their normal volume and permeability. No solution containing salts alone was able to remain in the circulation. Hence the rise of blood pressure when saline alone was injected was only transitory. The presence of a colloid possessing the osmotic pressure of blood was essential; of those available, gum in 6 per cent. solution was the best. It was to be dissolved in 0·9 per cent. sodium chloride in order to be isotonic with the blood corpuscles. A good gum, such as that sold as "Turkey elect," must be used.

The work of Captains O. Robertson and A. Bock showed that after hæmorrhage the normal number of red blood corpuscles was ultimately restored by the bone marrow if the hæmoglobin had not been reduced below 25 per cent. of its normal value. If below this the red marrow ceased to act. The observations of Gesell[1] showed that dilution was more than compensated by the increased rate of supply, so that the oxygen supply to the tissues was increased although the blood was diluted. It had also become clear that deficient blood volume was more serious than decrease in the oxygen-carrying capacity of the blood itself. Little positive evidence was forthcoming as to the superiority of blood transfusion over gum saline.

Prolonged Anæmia.

Captain Robertson, in his report to Colonel Cannon, mentioned four classes of cases in which good results were not to be expected from the use of gum saline. These were: (*a*) Cases which had been in a state of shock and low blood pressure for a long time. (*b*) Cases of profound shock in which gum saline was injected before the ordinary means of warmth, &c., had been applied, or before any improvement was obvious. Such cases might be definitely injured. (*c*) Very severe hæmorrhage. (*d*) Cases of gas infection. The first was by far the most important. Two serious states resulted from prolonged anæmia of the tissues, either of which rendered it impossible to produce any permanent

[1] American Journal of Physiology, vol. xlvii., p. 489.

improvement of the circulation by intravenous injection of any kind. The first was paralysis of the vital nerve centres, the explanation being probably that the capillaries were normally under the control of the nervous system, and, in the absence of this control, allowed themselves to be distended, and thus soaked up large quantities of blood. Paralysis of the vaso-motor centre could be produced in cats by low blood pressure. If treated by gum saline shortly after the paralysis had come on recovery took place. If left for two hours or more, according to the degree of anæmia, recovery was impossible. The second pathological state induced by prolonged low blood pressure in the capillaries was an increase in the permeability of the blood-vessels to colloids. The clinical index that such a state had been reached, or was coming on, was a progressive concentration of the blood as regards corpuscles. If this increased permeability had not reached too high a value, or had not been present for too long a time, recovery was possible. Cases of prolonged and serious shock, therefore, failed to respond to both gum saline and blood. If the nerve centres had become numbed from prolonged anæmia, it was likely that the awakening by recovered circulation would be attended by unpleasant sensations, or by an increased sensibility to pain and discomfort. It might be supposed in such cases that the gum saline was doing harm, whereas the effects were the inevitable result of return to life.

In practice the following procedure might be recommended. If the ordinary restorative measures, such as rest and warmth, failed to give satisfactory results in half an hour or so, 750 c.cm. of gum saline should be given, warmed to body temperature and injected slowly into a vein, taking a quarter of an hour for the injection. If there was only partial benefit in half an hour, another 750 c.cm. might be given. If the first injection had had no effect, blood transfusion should be tried, but if the case was capable of recovery, the use of blood was very rarely necessary. Properly prepared gum was harmless, and no fear need be entertained of giving too much.

Condition of Circulation in Shock.

Dr. H. H. DALE spoke of the difficulty of getting a clear definition of the condition to which the term shock was applied. It was applied to any condition of enfeebled circulation and generally depressed vitality following injury, provided that the onset was fairly rapid and that no hæmorrhage or sepsis adequate to account for the condition had been recognised. When the war broke out there were two rival main conceptions of the state of the circulation in shock; both recognised that the root of the trouble was the inadequacy of the blood-supply to the vital centre. One supposed that vaso-motor control failed owing to fatigue of the nervous centre, and that the blood in consequence became pooled in the great veins of the splanchnic area; the other attributed the deficiency to "oligæmia"—diminished volume of the blood in effective circulation.

"Primary shock" was seen usually in the front line, and seemed to be largely due to a weakening of vaso-motor tone caused rather by reflex inhibition than by fatigue of the centre. "Secondary shock" was seen mainly in the clearing stations and seemed to be due to oligæmia—diminished volume; and this had recently been shown to be so by direct measurements made by Captain Keith by the "vital red" method. The level of the arterial pressure was not, as under normal conditions, dependent on the tone of the arteries and the strength of the heart beat. The depression was due to the fact that the volume of blood expelled by each beat of the heart was remarkably small, not because the muscular activity of the heart was weak, but because the volume of blood poured into its chambers during diastole was inadequate to fill them properly. The great veins and arteries were also abnormally empty. Usually a fall of arterial pressure was associated with dilution of the blood by absorption of fluid from the tissues; here it was accompanied by loss of fluid from the circulation, which caused a rise in the proportion of the corpuscles. The missing blood must be lying in the capillaries, and the only condition which could be imagined to produce this peripheral accumulation of blood was a loss of tone in the capillary walls. The escape of plasma from the blood showed that they had become abnormally permeable. Acidosis as a cause was investigated, but was found to be an effect rather than the cause of the deficient circulation.

Experimental Investigation.

Injection of a few milligrammes of histamine into the vein of an anæsthetised cat or dog was found to produce a shock-like condition, having practically all the features which had been described as characteristic of wound shock. They supposed that histamine caused all the potential capillary channels to become slack and patent simultaneously, so that the blood spread and percolated into the whole network, which, when thus dilated, could accommodate a large part of the blood in the system. From the venous side of the network the blood then trickled slowly into the veins, and the rate of return to the heart was greatly reduced. The action of histamine typified the action of a large class of partial cleavage products of protein. Bayliss and Cannon from their experiments on anæsthetised cats had shown that massive injuries to leg muscles without any serious hæmorrhage produced a shock-like failure of the circulation even if the nervous connexion of the legs with the rest of the body had been interrupted. If the nerves were left intact while the vessels to the limb were occluded, no shock resulted from the injury. They attributed these effects to the absorption from the injured and autolysing tissues of products having the histamine type of action.

Absorption from injured tissues, and especially from injured muscles, of the products caused by injury apart from bacterial action, was regarded by surgeons from clinical evidence to be of great importance as a factor in wound shock. The conception was thus arrived at of an aseptic traumatic toxæmia playing a large part in the genesis of secondary wound shock. The results of experiments carried out on anæsthetised cats coincided with the experience of surgeons during the war with regard to the question of anæsthetic. Ether greatly increased the animal's sensitiveness to shock with histamine, whereas gas and oxygen was found to be relatively safe.

This traumatic toxæmia, the healthy organism, with its powers of resistance not otherwise impaired, could often cope with successfully. Many different influences could contribute to the depression of the natural resistance and power of recuperation, such as cold, lack of fluids, hæmorrhage, anæsthetics such as chloroform and ether, and probably pain and exhaustion. Much could be done to prevent the appearance of shock in the wounded man by eliminating these accessory factors and by removing the toxic focus when possible at the earliest possible moment. When the shock had once appeared and the effective blood volume had already become seriously depleted the only hope would seem to lie in restoring the volume by intravenous injection. When shock had become fully established the capillary walls were so injured that they were no longer capable of regaining the tone necessary for an efficient circulation.

Discussion: Prevention and Treatment: Anæsthesia.

The PRESIDENT said that in the early part of the war fluid, rest, and warmth were the only means of treatment which were available, and in many cases were sufficient to prevent shock. Later the use of splinting for badly damaged limbs was found to be most valuable. In 1916 and 1917 rectal saline was used, together with sodium bicarbonate solution to prevent vomiting and so enable patients to take nourishment. At the end of 1917 blood transfusion was used on a large scale, the credit for which was due to Americans, and especially to Colonel Hugh Cabot and Crile. When the blood in circulation was diminished fluid was very necessary, and it was essential to see that the men had enough to drink. It seemed to be forgotten that fluid could be given by the mouth. The British soldier, as a rule, preferred sweetened tea to anything else. Plenty of fluid, as well as rest and warmth, were the foundations on which the subsequent treatment must be built.

Dr. GEOFFREY MARSHALL said that the opinions of many workers differed as to the value of gum saline, but there appeared to be no doubt as to that of blood. Before the war the effect of anæsthetics in the production of shock was recognised. During the war spinal anæsthesia was found to be dangerous for patients who had recently been wounded. When ether was administered the patient was in good condition on the operating table, the blood pressure remained up until the end of the operation, but within 1 to 2 hours it fell to 30 to 40 mm. Hg, and the patient died. With chloroform the lowering of the blood pressure came later, and patients died 5 to 10 hours after the

operation. With intravenous ether the immediate effects were good, but about an hour later the condition became poor and death followed. Gas and oxygen was much the best form of anæsthesia. At the end of the operation the blood pressure was within a few millimetres of what it was at the start, and half an hour later there was a slight fall of about 10 mm.; the blood pressure then went up and the patient was able to take food, and even with high amputation of the thigh there was no sign of shock. In abdominal operations shock was not such an important factor, and the form of anæsthesia did not matter so much unless the patient's condition was very grave. During the last year of the war operations had been done on pulseless patients, gas and oxygen being the only anæsthesia which could be used. It should, however, be remembered that with it muscular relaxation was not so complete, and in abdominal operations it was necessary to inject novocaine into the abdominal wall.

Captain E. S. TAYLOR said that it was the duty of the anæsthetist to watch the blood pressure carefully during the operation, so that if any immediate treatment was needed it could be carried out at once. If with gas and oxygen the blood pressure fell during the operation this was due to loss of blood. With this form of anæsthesia there was an absence of the usual after-effects, such as vomiting, coughing, sweating, &c.; the patient was awake and could be given fluid. Spinal anæsthesia failed because the vaso-motor system was impaired; with gas and oxygen both the vaso-motor and the peripheral systems were unimpaired.

Colonel H. M. GRAY said that the use of morphia had been condemned theoretically and clinically, but the good and bad effects depended upon the way in which it was used. If the patient was moved at once the effect was not so good as if he were left to lie for a quarter of an hour or so until the morphia had taken its effect. The initial dose should not be less than gr. ¼, but gr. ½ was preferable. In his opinion pure blood was better than gum. Arrangements in the front areas should be adapted to civil conditions, and rest, warmth, and splints should be provided in factories and mines; heated ambulances should be supplied, and special resuscitation wards should be provided at general hospitals, so that patients who were suffering from shock as the result of an injury need not be put into the general wards.

Causation.

Mr. J. D. MALCOLM referred to his views on the changes in the vascular system which occurred as a consequence of severe injuries, which were found also in certain cases of intestinal distension and in cases of febrile reaction and of septic inflammation. He thought that in surgical shock the loss of blood and the changes in its composition were brought about by a reflex contraction of the vessels consequent upon irritation of tissue. This could not take place unless the blood in the vessels was reduced, and there was strong evidence that fluids were forced out of the vessels and out of the body, whilst blood corpuscles were destroyed in excessive numbers and remained with the bile. It had been said that blood which was displaced from the arteries and veins was held up in the capillaries, but direct evidence of this was wanting. Distension of the capillaries was supposed to occur in blushing and in the morbid flushing of women at the menopause, but in both these conditions the state of the tissue was unlike that in cases of shock. Crile had asserted that in a state of advanced developing shock, if saline solution was injected, it immediately passed out of the vessels into the connective tissue, where it caused œdema. From this and from other observations which Mr. Malcolm mentioned, it seemed as if the primary factor in the development of shock was a contraction of the vessels proportionate to the degree of irritation of tissue, and that the surgeon's first object should be to relax these vessels by the administration of opiates and warmth, and by preventing the action of other causes of irritation. When the vessels began to relax, fluid was rapidly absorbed when offered in any way.

Dr. E. M. COWELL said that in secondary shock the blood pressure fell after some hours as the result of several factors, one of which—cold—could not be emphasised too strongly. This was not sufficiently realised, especially at home, where the theatre and operating table were frequently cold. In hæmorrhagic cases he thought that blood must be given, but where bleeding was not excessive gum gave very good results, was much more convenient, and was easy to procure.

Captain LOCKWOOD spoke of a condition which he had seen in which there was profound shock and in which, at autopsy, there was marked collapse of the lungs, though pieces of lung tissue floated in water. In these cases injury was either absent or negligible. Histologically, fat embolism of the lungs had been found. He had made post-mortem examinations on four cases, and an Australian officer whom he had met had autopsied six or seven, and said that he had noticed men lying dead without wound of any kind.

Dr. J. W. MCNEE said that he had made autopsies on a number of cases of severe wound shock in order to determine its causation. He found that the wounds were often insufficient to account for the fatal issue, and the patients certainly did not die from bacterial infection. Each wound was trivial, but collectively there was a good deal of damage to muscle. If a patient could be resuscitated so that operation could be performed and the damaged limb removed, recovery was often remarkable. In one case which Dr. Bayliss had considered typical of pure wound shock the pancreas was swollen, and had much the same appearance of acute pancreatitis.

Other Views on Treatment.

Major ROBERTS spoke of the success obtained with gas and oxygen as compared with ether and chloroform. Cultures had been made from the blood of patients undergoing operation, and when anaerobes were cultivated the mortality was most severe. Before the war it had been noted that if in extensive burns the damaged tissue was removed the results were much better. Experimentally in animals if damaged tissue was removed improvement followed. The same thing occurred in men after the removal of damaged limbs, though they had been regarded as hardly able to stand an operation. He had used gum in a large number of cases and was disappointed with its effects. He thought it by no means equalled blood.

Colonel LAPTHORNE SMITH, C.A.M.C., said that if there was time before the operation it should be seen that all the vessels were well filled. The operation should be rehearsed previously with a good team so as to reduce the time it would take. No blood should be lost, and for this purpose arteries should be tied before being cut. Every drop of anæsthetic given counted against the patient, and the amount should be reduced by the simple means of administering morphia and atropine beforehand. Warmth was most important. The room should be kept cool and well aired, and the patient warm by a warm operating table, the tins under the patient being kept at a temperature of 105° to 110° F. All the blood possible should be sent to the heart by keeping the legs raised. Even if a man had lost one leg the other held a useful amount of blood. Fluid should be given slowly by the rectum at the rate of about a drachm per second or per minute.

General CUTHBERT WALLACE said that obviously the optimum substance to replace blood was blood, but gum was easily obtainable and might tide a man over a difficult period.

The PRESIDENT spoke of the urgency of saving time. Intravenous injection should be done as soon as possible, and therefore as far forward as possible.

REVIEW OF RECONSTRUCTIVE SURGERY.

At a meeting held on Friday, April 11th, Sir ROBERT JONES in the chair,

Major R. C. ELMSLIE read an opening paper on Surgical Treatment. He said that in the treatment of injuries the first object of the surgeon was the preservation of life; this done, the ultimate object was the restoration of function. Reconstructive surgery was that surgical work which was undertaken with this end in view. The surgeon's first duty was to make a careful routine examination, followed by an analysis of the conditions present and an accurate diagnosis, his aim being to determine exactly what anatomical and pathological lesions were interfering with the return of function. The determination of the presence of anatomical fault or of a pathological lesion left by an injury did not necessarily indicate that surgical treatment was advisable for its correction. This was only so if the correction of the fault would improve the functional utility, but functional disability was often due to some associated condition. With regard to operation starting a recrudescence of sepsis it was often found possible to correct

that element in the deformity which was causing the disability by performing a simple osteotomy through healthy bone at a little distance from the original injury, and thus, while accomplishing the object in view, to avoid the risks involved in opening up the site of the old injury.

The methods of reconstructive surgery were: the repair by surgical means of the damaged part, so far as this was possible; the replacement of functions which were definitely lost by the use of the remaining healthy parts by such means as tendon grafting, tendon fixation, and the fixation of joints; the restoration of function by methods of physiotherapy, including treatment by massage, passive movements, baths, re-educational exercises, gymnastics, and active work; the replacement of function by the fitting of an appliance, such as an artificial limb, and by education in its use. The principles of reconstructive surgery were comparatively simple, and rested upon a basis of anatomy, pathology, and mechanics, but in applying these principles the actual conditions to be treated were complicated, difficult, and often were peculiar to the individual case.

The Elimination of Chronic Sepsis.

Apart from the direct risks of a spread of infection—loss of the limb or even loss of life—the presence of septic infection rendered all reconstructive work, or even treatment by physical methods, unsafe. There were two causes for the persistence of sinuses which resulted from old septic compound fractures—the presence of some foreign body (usually a sequestrum), and the presence of a cavity surrounded by bone and by dense scar tissue. If these conditions were eliminated the sinus would heal; small cavities could certainly fill up in time, but large ones—those large enough to hold a good-sized pea—might go on indefinitely.

Every chronic bone sinus should be treated by radical operation, the appropriate procedure being that devised by Broca. Major Elmslie then described the method of performing this operation, which, he said, had already become widely known but ought to be universal. In many cases, before a major reparative operation, it was desirable to do a preliminary exploration, because latent foci were not infrequently present, even in wounds that had healed for months, and as a thin adherent scar which had to be lifted during an operation would certainly slough it was better to excise it as a preliminary.

Non-union of Fractures.

The essential cause of non-union of fractures was loss of substance, so that there was no osteogenetic substance to bridge the gap. In the surgical treatment of non-union the essential was to make sure that there was a continuity of bone and of bone-forming tissue. When it was necessary to bridge a gap in bone this bridge should consist of living bone which was capable itself of growing and adapting itself to its new function. The essentials of a satisfactory graft of bone were (1) that it should contain living osteogenetic tissue; (2) that it should be viable in its new site; and (3) that it should be strong enough to do the work assigned to it. The viability of the graft was best secured by always taking a graft from the patient himself. Experimental work would indicate the use of cancellous bone as it bore more osteogenetic cells, but clinical work favoured the heavy, massive graft, because strength and security of fixation were of such importance.

With regard to *flail joints*, two solutions were possible: to fix the joint at a suitable angle and thus to bring the limb into activity, or to restore a fairly stable joint which was still mobile.

Tendon transplantation might be most useful or most useless, and ought only to be carried out in selected cases in which it was mechanically sound. A careful selection of the muscle was necessary, as by using a wrong muscle harm might be done. It was not always possible to transplant muscles so as completely to restore normal active movements, yet the operation might have the required functional result.

Physical Treatment in Relation to Orthopædic Surgery.

Major W. ROWLEY BRISTOW read a paper on Physical Treatment in Relation to Orthopædic Surgery. He urged most strongly the need for thorough coöperation between the surgeon and physio-therapist. They were working for a common end—the ultimate restoration of function—and frequent consultations should take place between the surgeon and those in charge of the special departments, so that the surgeon should have an opportunity to indicate the general plan which he proposed to follow in any particular case. There was often useless and needless waste of time occasioned by treating patients who would derive no benefit and for whom all that could be done had been done. Efficient supervision by a competent medical officer could alone obviate this. The need for men with general clinical experience and a good sound general knowledge of medicine and surgery was apparent. The ideal officer was a general clinician first and a specialist afterwards. It was very important to keep in mind the prominent part that re-education played in physical treatment, whatever method was adopted. The various methods of physical treatment and their uses were discussed, and special stress was laid upon the point that faradic stimulation must immediately be followed by voluntary effort, in which the patient was taught and encouraged to reproduce the movement which had been provoked electrically.

Captain MORTON said that suggestion was one of the most valuable forces in life, but if worked under abnormal conditions would produce abnormal results. Many abnormal conditions were prolonged by suggestion. Functional paralysis was, he thought, due to anæsthesia of the muscles. The patient had lost touch with his muscles through disuse; it had been impressed upon him that he must keep the injured limb quiet, and for a long time no message had been sent by the sensory nerves.

Discussion on Reconstructive Surgery.

Colonel H. M. GRAY said that reconstructive surgery had a wide application, as well from the administrative as from the surgical point of view. Reconstruction must be begun immediately after the injury had been received, the treatment being preventive as well as curative. Many lessons had been learnt, such as the handling of injured men, splinting, treatment of shock, &c., and these should be applied to the conditions of civilian life. He suggested that the large hospitals should be situated on the outskirts of the towns, the dressing stations and the casualty clearing stations in the busy areas. There should be frequent informal visits between the surgeons at the several hospitals, just as there were between the workers in hospitals in France.

Major E. W. HEY GROVES described the methods he had followed in reconstructing the crucial ligaments, the anterior by utilising the ilio-tibial band, the posterior by utilising the tendon of the semi-tendinosus muscle. He had operated on 12 cases, in 8 of which function was restored and the patients were able to carry on their occupations without the aid of appliances. He also described the means he had taken to secure fixation of bone grafts and provide rapid vascularisation.

Captain D. AITKEN said that there was a tendency to regard the operation as though it comprised the whole of reconstructive bone surgery, whereas it was but an introduction to subsequent treatment.

Major FRANCESCO, Medical Corps, U.S.A., described the methods of treating orthopædic cases in France.

Practice and Teaching of Orthopædic Surgery.

Sir HAROLD STILES said that all surgery was more or less reconstructive. The difference between reconstruction in orthopædics and in general surgery was that in the latter, and especially in abdominal cases, it concerned involuntary muscle. He hoped that orthopædics would be made a part of general surgery, that the practice and teaching would be reorganised in general hospitals, and that in them there would be team work. Progress had been made in orthopædic surgery because of team work by young men with receptive minds, new problems to face, and imagination. He hoped that other large schools would follow Edinburgh and institute lectureships in orthopædic surgery. Speaking of flail joints, he said that if heavy massage did not light up inflammation about the joint it was safe to operate. He made a practice of putting the limb up in plaster on the operating table in the position which he wished it to occupy. A flare up did not matter if ankylosis was the objective.

Major N. DUNN said that no patient should be discharged until he had learnt to use his limb, nor should he leave the hospital on crutches.

Lieutenant-Colonel SPENCER MORT described the methods which he had used in bone grafting, and contrasted those of civilian and military practice.

Captain MACMURRAY described the special methods he preferred in the treatment of flail elbow.

Among subsequent speakers were Mr. WELBY FISHER, Captain H. PLATT, Captain J. B. MENNELL, Dr. FLORENCE STONEY, and Mr. MURRAY LEVICK.

DEMONSTRATIONS.

Inflammation and Repair of Bone.

On Wednesday, April 9th, Colonel J. G. ADAMI, C.A.M.C., demonstrated a collection of bone specimens prepared by Major L. J. Rhea, C.A.M.C., late pathologist to No. 3 Canadian General Hospital, McGill, at Boulogne, who had returned to Canada. The interest of these cases lay in the singularly full study, both clinical and pathological, made in each case by Major Rhea. The full clinical history of each case had been obtained; a detailed description was prepared of conditions found post mortem or—in the case of amputations—in the laboratory, together with drawings of the position of the bone fragments; and accurate descriptions and photographs of the prepared specimens, in which the relationship of the parts found at autopsy or at the time of operation was carefully reproduced. The result had been a material advance in our knowledge of certain of the finer details of the process of inflammation and repair of bone, more especially in connexion with the part played by fissure fractures of bones, in the extension of the infective process, the relationship between pressure of apposed bones and the development of erosions, the production of sequestra and of new bone. Colonel Adami described more particularly the specimens illustrating inflammation of the knee-joint and fracture of the femur.

Injuries to Blood-vessels.

At the Royal College of Surgeons on April 9th Sir GEORGE MAKINS, the President, demonstrated Injuries to Blood-vessels by the aid of an epidiascope. The macroscopical and microscopical results of contusion of arteries with thrombus formation were shown and the changes which led to or followed secondary hæmorrhage. Other specimens were of arterial hæmatomata or false aneurysms, true arterial aneurysms, aneurysms showing a blockage by surrounding structures, and arterio-venous aneurysms.

A Hospital for Limbless Cases.

Colonel Sir J. LYNN-THOMAS gave a cinematograph lecture on April 10th at the Imperial College of Science on a Hospital for Limbless Cases. The idea of the Prince of Wales Hospital had been to take a man gradually from a state of helplessness to independence, whilst enlisting his own interest and coöperation at every stage. In the construction of a hospital for the limbless one had to start on principles different from those which obtained at general hospitals, as the condition of the patients was totally different. The main entrance to the hospital was therefore altered with a view to meeting the helplessness of the men who had had both legs amputated, and no modern appliances, such as lifts or supports in the bathroom, were introduced into the hospital so that they might be prepared for the ordinary conditions of their homes. The hospital was entered not by steps, but by an inclined plane, up and down which a man who had lost both his legs could take himself in a hand-propelled wheel-chair. From the first by this and similar devices the most badly crippled man enjoyed a certain amount of independence. The hospital served as a special annexe of the Orthopædic Centre of the Welsh Metropolitan War Hospital, Whitchurch, and there were three affiliated Red Cross hospitals as additional parts of the organisation. 1. Penarth Auxiliary Hospital, to which a man who had lost a *leg* and had been given a temporary appliance went for a time to gain confidence in walking. After he had been fitted with his permanent artificial leg at the Prince of Wales Hospital, and had there received preliminary instruction in its use, he went back to Penarth hospital for further training and practice before being discharged. 2. The second Red Cross hospital was at St. Pierre, Cardiff, for men who had lost an *arm*. They first learned there to use temporary appliances, and were afterwards fitted at the Prince of Wales Hospital with permanent artificial arms, and underwent some preliminary instruction in their use. They subsequently received practical training at different centres before their discharge. 3. Clyne House, Cardiff, rendered similar service to officers.

Treatment and Training of Limbless Men.

The wounded officer or man was admitted to the orthopædic centre, either directly from the front or after a period in a general military hospital. After undergoing such special surgical treatment, including operation, as might be necessary, he was fitted with a temporary limb, a new appliance invented since the outbreak of war, the best type being a modification of the Belgian pilon.[2] Wearing this he was encouraged to get about to test the soundness of the healing of his stump and to learn to keep his balance in walking. After satisfactory progress he was transferred to the Red Cross hospital, Penarth. Here he completed the second stage of the course of treatment and training provided, and became ready to be admitted to the Prince of Wales Hospital for the final stage—the fitting of the artificial limb specially made for him in the hospital workshops. The importance of having workshops on the spot was very great, for many small alterations and adjustments were necessary, and in making these the man's own feelings must be consulted and his advice accepted. No man or officer was discharged from the hospital until he pronounced his limb comfortable and had gained confidence in its use.

When a man first wore his new leg he was taken to the parade hall, a long room with terrazzo floor and two sets of parallel bars to suit men of different heights. The bars gave him confidence, and at the far end were mirrors so that he could see for himself any error he might make in his first attempt to walk, and was shown by an instructor how to correct it. In the case of a man who had lost both legs the problem was more difficult, and a longer preliminary stage was necessary. The difficulty of getting these patients into their artificial limbs had been overcome by a special appliance consisting of pulleys and tackle—an "aerial transporter crutch," by which the man could lift himself from his wheel-chair into his artificial limbs and allow just so much of his weight to rest upon them as he felt he could bear. Gradually, guided by his own sensations, he bore more and more weight until he found that he could stand, and finally began to walk. Experience had shown that it was very necessary to have arrangements for the testing of an artificial leg in actual use, and for the training of the man until he got accustomed to the variations in the level of roads and paths which passed almost unnoticed by a man with two sound legs. The garden of the Prince of Wales Hospital had been planned with this end in view. It was a miniature "Wild Wales," laid out with much skill to imitate the conditions existing in a land of hills and dales.

The department for artificial arms was arranged for training the men in their use and also for testing the strength and suitability of the appliances. It was provided with spring balances to record the power of lifting, pushing or pulling, and apparatus for measuring the breaking strain of steel wires, thongs, and ropes used in the construction of limbs. The training of men in the use of their artificial arms was superintended by an armless collier, the inventor of a most ingenious worker's arm, which he had himself used very successfully for over 20 years. His practical demonstrations had proved most inspiring and encouraging. In the garden were sand pits for the men in which to practise the use of various implements. An experimental workshop had been established to deal with new inventions and designs for artificial limbs for the upper and the lower extremities. The value of such inventions would be tested thoroughly under skilled supervision.

Demonstration on Fractured Femurs.

Major MAURICE G. PEARSON, S.A.M.C., gave a demonstration on the treatment of fractured femurs at the Imperial College of Science on April 10th. The first part of the problem, he said, was to save life, and, if possible, limb. Estimates of the mortality from fractured femurs up to 1916 varied from 50 cent. to 80 per cent., and if in the last year of the war it came down to a quarter of this, which is probably a safe estimate, the reduction was due to three main factors—better splinting, earlier and better operating at the front, and better organisation and appliances at the base. Many patients died long after arrival in England from the pain and exhaustion of the daily dressings. With better operating and better facilities for dressing, sepsis, and with it secondary hæmorrhage, were greatly reduced. The life saving and limb saving difficulty had

[2] THE LANCET, 1917, i., 964.

been, to a great extent, solved, and the next part of the problem was to get straight limbs of good length. At the present time the average shortening in good hospitals was well under half an inch for extensive shell smashes, complicated by the worst forms of sepsis, and for cases where large portions of bone had been shot away. That the anatomical results were so good was due to the substitution of the Thomas splint for the long Liston, to better methods of extension, and, above all, to greater use of radiography.

The functional results were not nearly good enough. There were many perfect results, but a very large proportion of war fractures of the femur were being discharged from military hospitals with knees whose range of movement at the end of their treatment was limited to 10 or 15 degrees, and with little probability of much improvement. It could not be too often reiterated that the pressing problem now was the improvement of functional results, which at present were deplorably bad. Since the time of Lucas-Championnière all the world had recognised the importance of preventing stiffness of joints adjacent to fractures by mobilising them from the very beginning. If the principle had never been generally adopted and applied in the case of fractured femurs, it was because of the real mechanical difficulties. It required some strategy and ingenuity to move a knee and leg without disturbing an adjacent fracture of the femur, but it could be done if it was done from the beginning before stiffness had set in; we owed much to Major P. L. Watkin Williams[3] for pointing out the need for this. Stiffness of the knee had been far too readily accepted as inevitable, and efforts had been concentrated on what were often futile attempts at curing the disability afterwards by massage, exercises, &c., instead of on its prevention.

Results of Organisation.

The numbers dealt with had been so large—there were 5000 fractured femurs in the British Army in France in the last nine months of fighting—that a system had to be worked out on factory lines, run by teams, every member of which had his or her own special duties, results being checked and work made lighter by mechanical contrivances wherever possible; so that, whereas at the beginning of the war half a dozen fractured femurs in a ward were a heavy load, we latterly had hospitals like Edmonton, with nine wards of fractured femurs alone, each ward of 30 or 40 cases, running as easily and with practically the same staff as any other surgical ward, and on the whole with much less pain and discomfort to the patients. The method to be described was one of the methods evolved as a direct result of war needs in France and afterwards further developed in England, when special femur hospitals were started; it had been the routine treatment for all cases, simple or compound, at the South African Hospital in France and at Edmonton Military Hospital.

Lantern slides were shown demonstrating the method of treatment recommended, the essential points being traction by means of a special non-penetrating form of ice-tong calliper applied *on to* but not *into* the lower part of the shaft of the femur, thereby rendering possible the early movement of the knee and leg below it without interfering with the femur, and at the same time leaving the whole limb bare from hip to toe and available for massage and electrical stimulation of muscles.

The new form of hospital bed was shown which was specially designed for fractures and back injuries, and enabled any part of the patient to be got at for dressing purposes without any lifting.[4]

Photographs were shown to demonstrate the excellent muscular condition of the injured limb throughout treatment, and the flexibility of joints. Cinema films were shown of recovered patients walking and going through exercises six months after being wounded by shell or bullet.

The Royal Army Medical Corps Museum.

Lieutenant-Colonel F. S. BRERETON, R.A.M.C., exhibited the material at the Army Medical War Museum, Avenue Studios, Fulham-road, S.W., on April 11th. The Museum contained models of dressing stations, pictures, models of sanitary and other contrivances, and a large number of exhibits of medical apparatus captured from the enemy, which had been brought together from all fronts. There were no pathological specimens, as these were at the Royal College of Surgeons, Lincoln's Inn Fields. The preparation of the museum was commenced in March, 1918, two artists, Lieutenant Gilbert Rogers and Staff-Sergeant Austin O. Spare, R.A.M.C., being employed. The number of artists had now been increased to eight, carpenters and handy men were also engaged, and all was under the direction of Lieutenant Gilbert Rogers.

The result of one year's work was shown on the walls of the studios, where nearly 200 pictures were displayed, besides the models already mentioned. The pictures showed types of the R.A.M.C., such as general duty men, nursing orderlies, dispensers, &c., types of bearers, officer types, &c. There was a series displaying women's work, mainly at the Endell Street Hospital, together with pictures showing the medical service at work on the battlefield, of which one model gave a very realistic idea. It represented Pozieres and incidentally gave a clear conception in miniature of a regimental aid-post, the model being completely fitted to the last detail.

Alongside the R.A.M.C. Museum exhibits were displayed which had been prepared on the premises for the Medical Section of the Imperial War Museum. These exhibits had been produced by the same staff and, when augmented by others to be prepared by the British Red Cross Society and Order of St. John, the Royal Naval Medical Service, and the Air Force Medical Service, should provide a very complete Medical Section for the Imperial War Museum. The Museum was unique and gave a good idea of the work done by the Royal Army Medical Corps, the conditions under which the duties were carried out, the equipment employed, and, as a contrast, the equipment used by the enemy—Germans, Austrians, Turks, and others. All the pictures and models were the work of members of the R.A.M.C.

SECTION OF PREVENTIVE MEDICINE AND PATHOLOGY.

THE DYSENTERIES: BACILLARY AND AMŒBIC.

A meeting was held on Wednesday, April 9th, Colonel S. L. CUMMINS, C.M.G., A.M.S., in the chair, when a discussion took place on the Dysenteries: Bacillary and Amœbic.

Bacillary Dysentery.

Colonel L. S. DUDGEON, C.M.G., A.M.S., said that bacillary dysentery was an infectious disease due to specific organisms and characterised by fever, tenesmus, and diarrhœa, followed by the passage of blood and mucus, but bacilli might be isolated from patients who had had diarrhœa for 24 hours without any other clinical manifestation. Such cases were important from the epidemiological standpoint, and it was these cases which served to explain the abnormal serological findings not infrequently referred to in the literature. The bacilli now known to give rise to dysentery were (1) the Shiga bacillus; (2) para-Shiga bacillus; (3) the Flexner group and those bacilli which might be grouped provisionally as para-Flexner bacilli.

Hæmocultures were made in 145 cases of bacillary dysentery during the acute stage of the infection. In two cases Flexner's bacillus was recovered. In all other cases the blood was found to be sterile by the methods adopted, in spite of the fact that the majority of the cases were examples of acute Shiga dysentery.

Sensitiveness of Dysentery Bacilli to Acids.

It was very essential that samples of stools should be received in the laboratories in the fresh state. If the specimens consisted of pure blood and mucus an interval of a few hours was permissible between the time the sample was taken from the patient and the bacteriological examination, but if fæces were present with the blood and mucus it was essential to avoid delay. In a paper by Dr. Lucius Nicholls, published in THE LANCET, on Chemical Affinities of Vibrio Choleræ,[2] attention was directed to the susceptibility

[3] THE LANCET, 1918, ii., 452.
[4] THE LANCET, 1919, i., 266.

[1] The investigations referred to in this communication were carried out by the speaker and by co-workers—Major A. L. Urquhart, O.B.E., R.A.M.C., Captain W. R. Logan, R.A.M.C., Captain J. F. Taylor, R.A.M.C., Captain A. Wilkin, R.A.M.C., Captain J. Bamforth, R.A.M.C., Captain B. J. Ryrie, R.A.M.C.; while special help was given by Captain R. R. Elworthy, O.B.E., R.A.M.C., Captain J. F. Gaskell, R.A.M.C., and Captain W. J. Deadman, R.A.M.C.

[2] THE LANCET, 1917, ii., 563.

of this organism to the action of acids. Dysentery bacilli were also sensitive to the presence of free acids, whilst they were able to grow freely in alkaline media. Suppressed vitality induced by acids might be recovered from by the addition of an alkali. Blood and mucus stools were alkaline when freshly passed, but if fæces were present and the sample was allowed to remain at laboratory temperature for some hours an acid reaction might develop. Experimental evidence was obtained that the addition of an equal volume of 3 per cent. normal sodium hydrate to pure blood and mucus stools at the time the specimen was collected from the patients was a distinct advantage, and still more so if the dysenteric stools contained fæcal matter. A higher percentage of positive findings occurred when it had been necessary to delay the bacteriological examination for some hours.

Serological and Cultural Tests.

The Shiga bacillus and para-Shiga bacilli.—Investigations had shown that there were two groups of these bacteria which could be differentiated by serological tests and by the fact that the group which they had designated para-Shiga + produced indol, while the group para-Shiga – failed to do so. The para-Shiga + bacillus corresponded to the organism isolated by Schmitz. Agglutinins formed by the para-Shiga – bacillus were specific, as were those produced by the indol-forming bacillus, whilst the true Shiga bacillus was not agglutinated by the para-sera or the para-bacilli by the anti-Shiga sera.

Flexner group.—Cultural tests were always necessary in the preliminary examination of the Flexner group so as to eliminate organisms which did not belong to the dysentery groups and to give an indication as to which agglutinating serum or sera should be employed. The cultural characteristics might be regarded as (1) primary and (2) secondary. The primary included the action on gelatin, lactose, glucose, and mannite; whilst the secondary reactions were those on cane sugar, maltose, dulcitol and litmus milk, indol formation and the presence or absence of hæmolytic activity. The Flexner bacilli conformed to the primary characteristics, but the secondary reactions were so inconstant and unstable as to nullify their use for the classification of these organisms.

The acid-agglutination test for Shiga, para-Shiga, and Flexner bacilli had been fully studied by them, but, in their opinion, had no practical utility.

Agglutination reactions in cases of bacillary dysentery.—The following conclusions were arrived at from the study of the blood serum obtained from a considerable number of cases of bacillary dysentery. (1) A reaction of 1 in 40 was a positive indication of a Shiga infection; (2) a reaction of 1 in 25 was strongly suggestive, and the test should be repeated a week later; (3) Shiga cases might show a high Flexner reaction; (4) cases of para-Shiga dysentery did not give a Shiga reaction; (5) many cases of so-called clinical dysentery could be proved to be Shiga infections by this method; (6) a rising or falling Shiga reaction was of considerable importance in the diagnosis of Shiga infection; (7) in every case of dysentery accompanied by pyrexia of unexplained origin a Shiga agglutination reaction should be undertaken, as it had been found to have been of considerable importance in such cases; (8) absorption tests were of value in the diagnosis of Shiga infections; (9) it was necessary to employ at least two, but preferably more Flexner antigens for the investigation of Flexner cases.

Methods of Spread.

Three methods by which bacillary dysentery was believed to be spread among a healthy population were briefly referred to.

Carriers.—The occurrence of mucus in the stools should be regarded always with grave suspicion among patients with a previous history of dysentery. Dr. E. H. Lepper, in her report to the D.M.S., British Salonika Force, said that positive results were only obtained from mucoid specimens, the normal stools passed being negative. It had been found, too, that patients who had apparently recovered from dysentery and were not passing mucus at the time when it was searched for showed positive Shiga agglutination reaction.

Water.—The Shiga bacillus was cultivated up to a period of 96 hours from crude water which had been stored at 37° C., whilst from sterilised water it was possible to isolate the Shiga bacillus after 240 and 336 hours when it was stored at room temperature, but not if storage was permitted at 37°. It was possible to cultivate the Shiga bacillus from river water stored at room temperature for 576 hours, but this was found to be impossible with water stored at 37°.[3] The bacillus retained its cultural and serological reactions when stored in water. The Shiga bacillus was cultivated also from water which had been chlorinated previously by an expert. These experiments showed the necessity for efficiently protecting all water which was to be employed for drinking purposes.

The rôle of the fly as a carrier.—It had been noted in Macedonia that bacillary dysentery was particularly prevalent during the spring and early summer and from the late summer to early autumn, when the fly pest was at its worst. During the hottest months of summer flies were considerably reduced in numbers, and there was comparatively little dysentery. From experiments on the incidence of flies it was found that the first fly pestilence in April and May was immediately followed by a great increase in dysentery in May and June, whilst the second in September, October, and early November was accompanied by an increase of dysentery of equal severity. As the result of these fly investigations the conclusions were arrived at that bacillary dysentery was most prevalent when flies were most numerous; flies, after contact with food infected with dysentery bacilli, were capable of carrying and disseminating these bacilli for at least 24 hours; and dysentery bacilli were isolated from wild flies captured in places in which bacillary dysentery was both endemic and epidemic.

In their opinion the following required further investigation: (*a*) the vitality of dysentery bacilli in water; (*b*) the relationship of flies to bacillary dysentery; (*c*) further investigations with the Flexner group of dysentery bacilli and with inagglutinable strains of Flexner bacilli; (*d*) on the toxins produced by dysentery bacilli; (*e*) the preparation of more suitable anti-sera for the treatment of the disease.

Arthritis as a Complication of Dysentery.

In all 25 cases of arthritis had been examined; in 10 of these a very careful study had been made. The fluid withdrawn resembled that in gonorrhœal arthritis. Another resemblance to gonorrhœa was the frequent association of conjunctivitis. Fluid withdrawn from the affected joints was found to be sterile in every case except one in which the Shiga bacillus was present. Injection of the fluid into the peritoneum of rabbits had failed to produce infection. Injection into the anterior chamber of the eye had also given a negative result. Arthritis was usually associated with infection by the Shiga bacillus. In two cases where no bacilli were present in the fluid the latter had been found to have a high agglutination reaction to the Shiga bacillus.

Amœbic Dysentery in England.

Professor W. YORKE read a paper on Amœbic Dysentery in England, with special reference to diagnosis, the importance of carriers, and the chances of the disease becoming endemic in this country. Much of the data given was the result of the work of Mr. J. R. Matthews and Mr. A. Malins Smith, who were at the Liverpool School of Tropical Medicine during the three years when the work was carried out; Miss D. Mackinnon and Mr. H. F. Carter took part during the year 1916–17.

Examinations for the detection of carriers were carried out for two main reasons: (1) carriers of *E. histolytica* were regarded as dangerous to the country in that they might be a means of infecting others; (2) so long as a man harboured these cysts it was considered that he might be subject to a relapse of acute dysentery or to hepatic abscess. In all over 4000 chronic or convalescent dysenterics had been examined at the tropical school in Liverpool, and *E. histolytica* cysts had been found in 11·5 per cent. of the cases. Of 450 non-dysenteric soldiers examined about twice each, 7·8 per cent. were found to be infected. The results given in a table showed that there was a considerable percentage of individuals infected with *E. histolytica* amongst persons who had never been out of Great Britain; all, with but few exceptions, were healthy, and none gave a history

[3] In all these experiments flasks containing 500 c.cm. of water were inoculated with one loop of a 24-hour culture of *B. Shiga* in Dreyer's medium.

of dysentery. Amongst 548 children (in a children's infirmary) 1·8 were found to be infected, amongst 450 men and women (patients in a general hospital) 1·5 per cent., amongst 1098 young recruits 5·6 per cent., and amongst 207 lunatics 9·7 per cent. Further investigation showed that the recruits had not been infected by men who had returned from abroad, and it would seem as if for some reason young men of 18–19 were more heavily infected than the civilian population regarded as a whole. Matthews and Smith showed that out of six families (to which six of the examined and infected children belonged), comprising 25 members, no less than 17 (68 per cent.) were found to be infected with *E. histolytica*. The significant fact was that none of them had had dysentery.

Wenyon and O'Connor concluded from their investigations that the native of Egypt was acting as a reservoir of infection for the intestinal protozoa with which the British troops had become and were becoming infected, but the study of another table, which was shown by the speaker, brought the following facts to light. The degree of infection with *E. histolytica* was approximately the same in the following four groups: (1) young recruits who had never been out of England, and who had been in the army only a short time; (2) non-dysenteric soldiers invalided from abroad; (3) chronic or convalescent dysenteric soldiers invalided from abroad; and (4) healthy British troops in Alexandria.

The Question of Spread in England.

With regard to the danger of an outbreak of dysentery in this country, it was important to determine whether the infection was of recent introduction into this country or was of old standing. His opinion was that, although only recently discovered in persons who had never been out of England, it was probably of old standing and not of recent importation. "Carriers" must constantly have been entering this country before the war; all the factors necessary for the spread of the infection were to be found here and details of well-authenticated cases of acute amœbic dysentery and amœbic abscess of the liver were on record in the literature. For these reasons he was inclined to believe that the widespread infection which the work of Matthews and Smith had disclosed amongst the population of this country was not of recent importation, but was of old standing, and had not been discovered simply because it was not expected and therefore not looked for. Certain classes at least of the population were heavily infected, but few indigenous cases of acute amœbic dysentery had so far been recorded.

The facts (1) that under certain conditions the infection could spread in England to such an extent that the population became infected to a degree equal to that found by Wenyon and O'Connor as occurring in Alexandria, and (2) that practically no cases of acute amœbic dysentery had yet been recorded, suggested that possibly some factor, at present unknown, might be necessary before acute amœbic dysentery developed. Even under the most favourable circumstances many were infected, but comparatively few developed the disease. It was possible that there might be a number of cases of amœbic dysentery here which were not recognised.

Diagnosis and Treatment.

From the administrative point of view the recognition of the carrier was a simpler matter than the diagnosis and treatment of the acute, or more especially the subacute, dysenteric. The viability of the cysts outside the body was considerable, and they could readily be recognised in stools passed many hours or even days previously. In its vegetative state the entamœba was of low viability outside the body, and the parasites quickly became unrecognisable, or recognisable only with the greatest difficulty, by the expert. The present military system might be adapted for the recognition of carriers, but it was by no means so well fitted for the diagnosis of acute or of subacute dysentery. The instructions laid down by the Army Council for the treatment and disposal of convalescents from dysentery were admirable, but those responsible for the instructions should take steps to ascertain the manner in which their instructions were carried out.

There was little difficulty in distinguishing the encysted stage of *E. histolytica* from the corresponding stage of *E. coli*, but the differentiation of the vegetative stages of the two entamœbæ was very difficult. Wenyon and O'Connor decided to call no infection one of *E. histolytica* unless some at least of the entamœbæ contained blood corpuscles, or unless they could find definite cysts of *E. histolytica* associated with the amœbæ in the stool, and from experiment they concluded that "*Ent. coli* did not readily ingest red blood corpuscles under the conditions of experiment"; the speaker, however, considered that if an experiment could be devised under conditions more favourable to the activity and growth of *E. coli* than those obtaining in that of Wenyon and O'Connor it might be found that this organism also was capable of ingesting red blood cells. His own opinion was that there was no character by which it was possible with certainty to distinguish the vegetative stage of *E. histolytica* from the corresponding stage of *E. coli*. He would lay down as a general guide that if entamœbæ were found in numbers in the stools of a person suffering from acute or subacute dysentery the case should, for purposes of treatment, be regarded as one of amœbic dysentery. *E. coli* might be present in the stools at the beginning of an attack of bacillary dysentery, but as the dysentery continued they rapidly disappeared.

He drew attention to the value in the treatment of acute amœbic dysentery of bismuth subnitrate in massive doses, as recommended by Deeks. A combination of large doses by the mouth combined with hypodermic injections of emetine gave much more constant and satisfactory results than emetine alone. A preliminary saline purge should be given unless the acute dysentery had already persisted for several days. Emetine hydrochloride, gr. i., should be injected subcutaneously, and bismuth subnitrate, gr. i. or gr. ii., suspended in milk or water should be given by the mouth every two or three hours for a period of 12 days. Occasionally a morning saline might be necessary if the bismuth caused constipation. This treatment, in his opinion, invariably cleared the stools of entamœbæ—a result which could by no means be claimed for emetine alone—and caused the disappearance of the symptoms of acute dysentery, the stools speedily becoming less frequent and free from blood and mucus.

Discussion.

Professor F. W. ANDREWES protested against the use of the term *para-Shiga*. If two bacilli were distinct in their reactions he thought that they should have different names. In a short paper published in THE LANCET he had ventured to term it *B. ambiguus*. In those days he did not believe it to be the cause of dysentery, but in the light of facts brought forward by Colonel Dudgeon and others he was ready to revise his opinion. He had found in his experience that the acid agglutination test, if not always infallible, was often of considerable value in determining whether a given bacillus belonged to the Flexner, to the Shiga, or to some other group. Older writers had included lactose-fermenting forms as dysentery bacilli. Only recently had they been rejected on two grounds: (1) that no epidemics had occurred in which the lactose bacilli were predominant, and (2) that there was no evidence of antibody formation in the blood of those in whom the bacilli occurred. It must be remembered that these bacilli have a very slow velocity reaction. He had found it necessary to leave sera in contact with the bacilli for 24 hours. Observers who had not allowed this period of contact ought not to say that no agglutinin had been formed.

Amœbic Dysentery in United States.

Professor Sir WILLIAM OSLER had noticed a great difference between the amœbic dysentery of this war and that which occurred in the Baltimore outbreak shortly after the opening of the Johns Hopkins Hospital. In that epidemic the occurrence of serious complications had been far more common. To take one example, hepatic abscess had occurred in no less than 25 per cent. of all cases. He attributed the decrease of serious complications to the use of emetine. He did not consider that there was any danger of the development of epidemic dysentery in this country. No single case of a civilian with amœbic dysentery had been admitted into his infirmary during the war.

Colonel H. EMERSON said that on rare occasions amœbic dysentery had been found in every part of the United States. There had been no considerable increase of amœbic dysentery in the American Expeditionary Force during the

war. They had no more fear of an extension of dysentery than had Professor Osler. After the Chateau Thiery episode there had been an epidemic of benign dysentery in the American forces, which was chiefly remarkable for the large number of paratyphoid carriers afterwards found amongst these patients.

Bacillary Dysentery: Causation and Prevention.

Captain A. STOKES, R.A.M.C., believed that dysentery had been acquired from the Germans. It had not occurred in our army until the German trenches had been captured on the Somme. There had been a large number of cases in October, November, and December, 1916, and again at Messines in 1917. The explanation might be either that we had been infected by the Germans or that the sanitation was necessarily bad in a region recently taken over from the enemy. Last autumn dysentery centres had been established in the British Army, and all men found to be passing blood and mucus were sent there without waiting for a bacteriological examination. He presented a chart showing the rise of dysentery closely following the rise of diarrhœa. He believed both were due to an increase in the fly index. He considered the number of diarrhœa cases a more important indication of the rise of dysentery than the number of bacteriologically diagnosed cases. With regard to the number of strains of Shiga, he believed that that number was likely to increase with the number of years that they were examined for. He believed that prophylactic inoculation was the only way to combat dysentery.

Lieut.-Colonel DUNCAN GRAHAM dealt with the relation of dysentery to irritable heart. He thought that there ought to be more combined bacteriological examination and microscopic examination of stools. The spread of dysentery came from undiagnosed and uncured cases of bacillary dysentery. These should not be labelled carriers, they should be recognised and cured. He considered *B. Shiga* and certain strains of *B. Flexner* to be causes of dysentery, the other bacilli might be causes of diarrhœa. Arthritis and other complications he believed to be preventable by thorough serological treatment.

Classification of Dysentery Bacilli.

Captain E. G. D. MURRAY dealt with the classification of dysentery bacilli. He said that although certain strains of the Shiga-Kruse group do fail to agglutinate with a given serum they absorb the agglutinins for the homologous strain from the serum. Simple agglutination tests did not, therefore, always afford sufficient evidence whether or not a given strain belonged to the Shiga class. Colonel Dudgeon's *B. para-Shiga* – appeared to be identical with an organism described by Lancelin and Rideau in 1917 as "*para-dysentery*," while the *B. para-Shiga* + seemed to be the organism described by Schmitz and named by Abel "*B. dysenteriæ* Schmitz" in 1917. He regarded the various described varieties of the mannite-fermenting group as belonging in reality to a single serological species, comprising four main types of agglutinogenic antigens, any of which might predominate in a given strain. The recognition of their different types of agglutinating antigen was of considerable importance both to identify a given organism and for the purpose of diagnosis. An important aspect of the case depended upon the fact that the agglutinative and the agglutinogenic properties of a bacillus are by no means the same thing. It was nevertheless quite easy to show that an animal in process of elaborating agglutinins against any one of the Flexner type antigens, on receiving a dose of any other one, responds by raising the agglutinating titre of its serum for both types of antigen used; whereas in experiments in which the two antigens used differ widely in type such as Shiga and Flexner, the agglutinin curves for the different antigens rise and fall absolutely independently of one another. For this reason he was disinclined to separate the Flexner Y species into strict serological groups. He had isolated three strains of a mannite-fermenting group whose distinguishing character was that lactose is fermented late (2 to 20 days). Unfortunately he had recognised them too late to be able to test them against the patient's blood, but Major Perry, R.A.M.C., had told him that in a case from which he had isolated this organism the patient's serum agglutinated it in very high dilutions. He was convinced that this class, which closely resembled the "Kruse E" class, was deserving of more attention. He referred to the observations of Colonel Dudgeon concerning the value of adding alkali to dysentery stools when it was necessary to delay examination. He had found that dysentery bacilli during their growth greatly increase the alkalinity of the medium, and that in the case of the Flexner group free ammonia was easily detected.

Questions of Diagnosis and Treatment.

Dr. F. W. O'CONNOR, speaking of the *Entamœba coli*, described it as the scavenger of the gut. It engulfed the cysts of almost all the other protozoa. He also urged the importance of simultaneous microscopical and bacteriological examinations.

Major A. M. W. ELLIS believed that only a small proportion of the men with bacillary dysentery had been diagnosed in France. Most, if they reported sick at all, were diagnosed "diarrhœa" and sent back to the trenches in a few days. In his clearing station he had found that 33 per cent. of those clinically non-dysenteric gave positive results bacteriologically. Even when a positive diagnosis is given the man remains 24 hours in his unit during the most infectious period. The only way to prevent this was to institute sanitary police, which method he thought was not practicable.

Colonel W. H. WILSON, A.M.S., drew attention to the possibility that among the welter of organisms now found in the stools we might be overlooking the occurrence of typhoid fever in inoculated troops. He quoted post-mortem evidence proving that typhoid fever had been confounded clinically with cases of dysentery.

Sir WILLIAM LEISHMAN urged that the evidence from all theatres of war had not yet been collected, and that the answers to many debatable points must depend upon the immense task of collateral analysis of all this evidence. He had always held that there was no danger of amœbic dysentery establishing itself in this country. The French had at one time been seriously alarmed at the prospect of amœbic dysentery being introduced into France by the African troops. There had been no spread of the disease, however, in that country. The question of diagnosis of both amœbic and bacillary dysentery was an important one. Many men had been invalided to England simply because cysts had been found in their stools. With regard to the transmission of bacillary dysentery, he thought flies played an important part. Epidemics had in many cases followed the increase in the number of flies. In other cases, however, no epidemic had resulted. There was more to be learned on this subject.

Mr. J. RAMSBOTTOM spoke on the distinction to be observed between the encysted forms of *Entamœba histolytica* and *Entamœba coli*, and discussed the treatment of cyst carriers.

Captain PERRY, speaking of the carrier question, agreed that the persistent appearance of mucus in the stools was an indication of infectivity, but said that the presence of agglutinins in the blood could not be considered as such an indication, since he had found them in the blood of patients who had been perfectly healthy for two years.

Colonel BATENAY said that the fly carried infection by its legs, by its vomit, and by its excrement. The latter was the most important.

Replies to Discussion.

Colonel DUDGEON, in replying, agreed with Professor Andrewes that *B. para-Shiga* was not a good term, and hoped that a better would be found. He described experiments in which he had tried to infect young rabbits with *B. para-Shiga* both by feeding and by introduction of the bacilli into the gut. In no case was true ulcerative colitis produced. But the appearance of this bacillus in blood and mucus of dysentery patients must be taken to be of some significance. He thought dysentery might be caused by lactose fermenters. In his experience the relation was not proven. Diarrhœa was so common in the East that no system of policing could possibly be carried out.

Professor YORKE said he had listened carefully to the two speakers who described a difference between *E. coli* and *E. histolytica* in the vegetative state, but he had not been able to cull from their remarks in what that difference consisted. Referring to the presence of amœbæ in the stools of healthy patients, he felt that there must be some unknown factor which was necessary before the amœba could develop a dysentery.

MALARIA IN ENGLAND.

At a meeting held on Friday, April 11th, with Sir RONALD ROSS in the chair,

Lieutenant-Colonel S. P. JAMES, I.M.S. (ret.), read a paper on the Risk of the Spread of Malaria in England and the Measures Necessary to Prevent It. In August, 1917, he said, it was discovered that locally contracted cases of malaria were occurring among soldiers and civilians who had never been out of England. Continuous systematic inquiry was made, with the result that the total number of such cases now known amounted to 326. It had been shown as a fact that in many rural areas in England into which a carrier went there was a potential risk of the occurrence of locally contracted cases of malaria, and it might be inferred that this risk existed in nearly all rural parts of the country. On demobilisation malaria carriers, instead of living in a limited number of military areas, would become scattered throughout the country, each in his own home. In the whole country perhaps some 20,000 homes might each contain a malaria carrier. In these circumstances our first duty was to endeavour to define in more detail the particular kind of locality and the particular circumstances in which anxiety might be justifiable and exceptional action might be needed.

Factors in Production of Malaria.

Last year the Local Government Board had limited precautionary measures among the civilian population, including notification, to certain "malaria suspected" or "dangerous" localities, selected on the ground either that indigenous cases had already occurred in them, or that they were areas in which a considerable concentration of malaria carriers coincided with an abundance of anophelines. The new conditions were not altogether favourable. During the present year there would be no great concentration of carriers in any locality, but, on the other hand, observations made during 1918 showed that the presence of many carriers and an exceptional abundance of anophelines was not, in every instance, a sufficient explanation of the occurrence of locally contracted malaria. It was found (1) that in a number of places which harboured many carriers and numerous anophelines no new case of malaria arose; (2) that some of the new cases recorded arose in areas which harboured only one or two carriers and exceedingly few anophelines.

Three factors were necessary to produce malaria—(1) carriers, (2) anophelines, (3) persons susceptible to infection. Clearly a fourth factor was also necessary. This he believed to be the continuous close association of anophelines, carriers, and susceptible persons. He himself had noticed in a country lane in Surrey that the *maculipennis* seldom remained for any length of time in a well-lighted and well-ventilated house, but in a primitive type of cottage would quickly settle in numbers in dark corners and on the smoke-grimed rafters of the living room, and would make no attempt to fly out. He had also compared in the same manner hospital wards, with cottages, cowsheds, and stables at Epsom, and a modern residence with an occupied hut at Bournemouth. The *maculipennis* seemed to seek first for a suitable home, the food sense not being manifested until this was found.

In Queensborough malaria was localised in a special manner in what were spoken of as "malarious houses," which were very favourable for mosquitoes. Although carriers were known to reside in the more modern houses, no new case from them had been brought to their notice. The requisite degree of close and continuous association was likely to occur only in the particular type of dwelling which *maculipennis* selected as its permanent resting and feeding place. This kind of dwelling might be similar to the malarious houses in Queensborough, or might be one which had the characters of an old-style raftered, low-roofed barn, was stuffy and hot, ill-lighted, ill-ventilated, and had dark recesses, cupboards, old drapery, and much furniture; and it was least likely to be the modern room, with clean bare walls and ceilings, large windows, and little furniture.

Measures of Prevention and Control.

With regard to the necessary measures for prevention and control, it was most important that in every reported case of malaria sufficient inquiries should be made to ensure that every case of indigenous origin came to light as soon as possible, so that appropriate action might be taken at once if there was a definite focus of infection. It was also important that as far as possible thorough inquiries should be made into each case of relapse among demobilised soldiers, and that there should be proper arrangements to provide those patients with adequate treatment and with education in, and facilities for, carrying out the measures which they should adopt to prevent the infection of other members of their household.

Two questions had recently been put to him unofficially by different medical officers of health, whether it was advisable to recommend comprehensive antilarval measures with a view to preventing the spread of malaria, and whether it was advisable to recommend that cowsheds should be whitewashed and otherwise made inimical to *maculipennis*. Generally speaking, and unofficially, his opinion was that it would be difficult, if not impossible, in England to find a locality in which, solely for the prevention of malaria, it could be said that antilarval measures would be "worth the candle." For this and other reasons he did not think it would be advisable to recommend them. As regards washing cowsheds, we knew that unwashed cowsheds were very attractive to *maculipennis* and that specimens of this species which flew into a cowshed were very loth to leave it. If this were so the specimens of *maculipennis* which got into cowsheds were not concerned with the spread of malaria, and our object should be, if possible, to make cowsheds so attractive to *maculipennis* that all the specimens of that species in the area would fly into them. What we wanted to do was to keep *maculipennis* out of houses, and if whitewashing or other "cleaning up" was done as an antimalarial measure it was best done to the dirty and dark corners of the dwellings which might be occupied by malaria carriers. If we rendered cowsheds unfavourable for mosquitos there was a risk that they would more readily make their homes in houses.

In conclusion, he suggested the probability that it would be found true of protozoa, as it had been shown to be true of bacteria, that different strains varied in virulence. At Queensborough he had found cases of very mild malaria which had been infected with an indigenous strain of *plasmodium*. He had been unable to find any morphological difference between this protozoon and the more virulent strain imported from abroad.

Discussion: Malaria in the Navy.

Surgeon-General ISAAC SMITH spoke of malaria as it had been experienced in the Navy, classifying the cases treated into four groups according to whether they had been infected in the Eastern Mediterranean, in Mesopotamia, or on the East or West coast of Africa. From the Eastern Mediterranean only the worst cases had been returned to England. These showed very marked cachexia; relapses were frequent and not preventable by any known method of treatment. As in the case of those returning from Mesopotamia, many cases were associated with dysentery as a mixed infection. The Mesopotamian cases were mostly tertian, while those from East Africa were constantly sub-tertian in type and often resisted treatment with great obstinacy. From the Cameroons came cases of mixed sub-tertian and quartan malaria and other mixed infections. With regard to the danger of malaria in this country, all malaria cases discharged from the Navy were given one month's treatment before being demobilised. In some cases, however, the men were not content to wait for a month after their symptoms had subsided. The *maculipennis* was not a carrier of the sub-tertian malaria which came from East Africa.

Report on Malaria in England.

Captain ANGUS MACDONALD presented a typewritten résumé of the official records of the occurrence and control of malaria, imported and indigenous, in England, which is to be published for the War Office by the Consultant in Malaria. The report deals with the spread of carriers during the years 1916–19, with the existence of certain "dangerous areas" in this country and with the investigation of indigenous malaria undertaken by the War Office. The antimalarial measures which were adopted were as follows: 1. General: (*a*) Supervision by malaria expert; (*b*) blood examination of doubtful pyrexia; (*c*) supervision of troops from overseas; (*d*) segregation and screening of carriers; (*e*) special instruction of medical officers; (*f*) quinine treatment of the case and carrier; (*g*) entomological investigation. 2. Special, adopted mainly in the dangerous areas: (*a*) Destruction of mosquitoes in their winter

quarters; (*b*) prevention of larval development. Farmsteadings—stables, cowsheds, pig-styes—have been cleared of mosquitoes in winter months. Those not killed directly could not live exposed to winter temperatures outside. The effect of this destruction has been obvious in districts operated. Where "myriads" were recorded on March 4th, 1918, six were with difficulty found on March 4th, 1919. In districts under observation, not operated, *maculipennis* prevalence in 1917, 1918, and 1919 had not varied. The attack upon the larvæ had as its single object the removal of all vegetation from the surface of the water, by the cleaning out of ponds and dykes, and by the removal of overhanging growth. The results in this case have also been satisfactory.

The general conclusions on methods of prophylaxis are of especial interest. They are as follows:—Notwithstanding theoretical and real minimal value quinine as a preventive of malaria is practically valueless. For the individual netting is a sheet-anchor; for the community it is valueless. The direct limitation of mosquitoes is the only preventive measure of practical value; its application is direct and local, not vague and distributed; it is inexpensive and can be effected by the existing personnel, rightly directed, of any and every sanitary establishment; and in sound practical hands its results are absolute.

Captain Macdonald said that malaria had disappeared with comparative suddenness from this country 60 years ago. He suggested that if the history of malaria could be traced to a more remote period it would be found that outbreaks had occurred in England from time to time. Sixty years ago a large number of troops were returning from Eastern Europe, and it was probable that they had brought the disease with them. The fact that it had already died out once showed that malaria could not be established endemically. A temperature of about 60° F. was required for the incubation of the malaria protozoon. In this climate the necessary temperature was only reached during the months of July and August. The continuous close association between anophelines, carriers, and susceptible persons struck him as being not the fourth factor but as *the* factor governing infection. *Maculipennis* was, he thought, the most important anopheline in this country. In the summer it was to be found everywhere, but in the winter it needed shade, warmth, freedom from draughts and disturbance, and food. It was in stables that these conditions were most amply fulfilled. The factor governing the mosquito incidence in houses was the proximity of the houses to their breeding-place. The adult mosquitoes must be attacked in their winter quarters. In summer they were hard to find and widely distributed—the larvæ were then more vulnerable. Wherever anophelines and carriers were found in one district it was imperative that sanitary measures should be undertaken.

Quinine Prophylaxis.

General Sir HAYWARD WHITEHEAD spoke of the experience of the Salonika Expeditionary Force in Macedonia. They had found the prophylactic issue of quinine to be almost useless. The most valuable measures were good drainage and the destruction of mosquitoes. The ordinary mosquito netting was so fragile that 80 per cent. of nets were found to be holed even with a large staff of net-menders continually at work. Destruction of all undergrowth in the region of camps was found to be essential. They had been taught that the flight of the mosquito was not more than half a mile, but he believed, as a result of his experience, that it was considerably more than this.

Colonel ANDREW BALFOUR spoke in support of the prophylactic use of quinine. A distinction must be made between true quinine prophylaxis administered to those who had never harboured the protozoa, and relapse prophylaxis, which had to be carried out on very different lines. Quinine should be given in not less than 10 gr. doses towards evening on a full stomach and for two consecutive days, with intervals of four days. In districts of high malarial incidence it might be necessary to increase the dose to 15 gr. or to decrease the interval between doses. Quinine prophylaxis was an auxiliary method and should always be given a fair trial. It must be carried out thoroughly and carefully. The conditions of civil life were far more favourable to its success than were those prevailing in an army in the field; he felt it would be a great pity if this method were hastily abandoned.

Dr. MALCOLM WATSON considered that there was a danger of recrudescence of malaria in England at the present time. Never before had such a large number of "carriers" been spread over the country. He had gathered from contemporary literature that the disappearance of malaria from this country 60 years ago had been due to the improved drainage system. It was unfortunate that we possessed no real knowledge of the cause of this disappearance. In the last 18 years in the Federated Malay States—a rapidly developing country—they had had to deal with 18 varieties of anophelines, as compared with three varieties known in England. One by one they had discovered the factors responsible for the malaria of different districts and had been able to control the various types of anophelines. His experience was that this control might be achieved without great expense.

In reply to the CHAIRMAN, who asked for his experience of quinine prophylaxis, Dr. Watson said that he had tried it in 10 gr. doses without success. The dosage had been applied to whole populations and raised even to 20 gr. a day, but with the most disappointing results.

Dr. W. G. WILLOUGHBY said that towards the end of his service in Macedonia 1 man in 30 was being returned to the base with malaria. About half these cases were primary and half relapses. All these men had been taking quinine, some 10 gr. daily, some twice a week, some four times a week. He thought that while quinine prophylaxis might be continued, other methods should not be neglected.

Method of Administration of Quinine.

Major A. L. URQUHART said that at Salonika the most frequent form of ague was the benign tertian, second in frequency was the sub-tertian, while the quartan malaria, common among the native, was only seen rarely amongst our men. Some men who presented swarms of parasites in their blood were not nearly so ill, clinically, as others whose smears showed many less parasites. Oral administration of quinine was as efficient as other methods of administration. It was contra-indicated only when the patient was unable to swallow, as in cases of persistent vomiting or coma. The next best method was the intravenous. Where the intramuscular method had been adopted, necrosis of muscle about the site of injection was found to occur commonly.

Mr. A. W. BACOT quoted some interesting research which he had made into the value of different culicifuges. Under certain circumstances he believed that these were useful. It was important that preparations should contain as much as possible of the culicifuge with a minimum quantity of the inert base. Soft wax was found to be decidedly better than either grease or soap as a base. No culicifuge could be depended upon for more than two hours. He quoted an experiment proving that their action was by disguising the human odour and not by repelling the mosquito.

Captain W. A. MURRAY gave a long list of drugs used at the 4th London General Hospital in the treatment of malaria. No treatment had been found more successful than that of quinine, though sodium cacodylate and other compounds of arsenic were useful adjuvants to quinine. Certain cases relapsed in spite of all treatment. There had been two or three cases of nerve paralysis resulting from unskilful intramuscular injection of quinine.

Captain JOHN THOMSON considered that to administer quinine intramuscularly when the oral method was available was no less than malpractice. Quinine administered by the mouth caused the parasites of benign tertian malaria to disappear from the blood in four days. In malignant tertian malaria they disappeared at a somewhat longer interval. If a fair minimum dose (10 gr.) was administered it was found that the parasites disappeared from the peripheral blood irrespective of the dosage or method of administration.

Colonel G. S. BUCHANAN wanted it to be known that the Local Government Board were not taking a reactionary view concerning malaria in England. The extent of spread had been very small, except in one or two districts to which intensive study had been devoted. A new situation was now arising as the result of demobilisation. The measures they had adopted included the notification of malaria, the distribution of leaflets for the use of practitioners, and the provision of facilities for the examination of blood films. The occurrence of indigenous cases in any district would bring into action a special machinery of investigation.

Summary of War Experience of Malaria.

The CHAIRMAN brought the proceedings to a conclusion with a summary of war experience. This, he said, must be regarded as provisional, as many reports remained to be abstracted and digested. Two large official publications on malaria were in course of production, one by the War Office and one by the Salonika Expeditionary Force. Regarding the treatment of febrile attacks or relapses the following points had been pretty conclusively established: (1) moderate doses of quinine (20–40 gr. daily) suffice in the vast majority of cases to reduce both fever and asexual parasites within two or three days; (2) the sulphate, bisulphate, hydrochloride, and bihydrochloride of quinine are equally efficacious within narrow limits, but there might be clinical reasons for the occasional selection of one of these salts; (3) roughly, the same thing might be said of the three modes of administration; on the whole he saw no reason why the oral administration should be superseded as a general broad procedure in malaria; (4) rest in bed and good feeding are required during the attack, and for about four days after the temperature returns to normal; (5) in first attack and in complicated and serious attacks larger doses of quinine may be advisable—this point required more investigation; (6) many thought that the malignant parasite required much more rest and continuous treatment after attacks than do the other species of parasite.

The number of relapses might be very greatly reduced by a special treatment. The essential points of this anti-relapse treatment were that the quinine should really be given (60 to 90 gr. a week) under strict supervision, and that the patients should be living a healthy, vigorous life, and should be well fed meanwhile. This treatment generally allows the men to recover weight and to lose anæmia and other secondary symptoms. Regarding the absolute cure of malaria infection the results had not been nearly so definite. He doubted whether the "sterilising" treatments were really justified, but did not wish to discourage attempts to find a more satisfactory form of permanent cure.

As a result of all these observations he was not at all sure that quinine acts as a direct poison to the parasites, but was inclined to suggest that the drug only stimulates some natural antibody. Another point, suggested long ago, was that the parasites might be much influenced by season—i.e., relapses might be much more frequent and difficult to cure at certain seasons than at others. Regarding blackwater fever, Staff-Sergeant Nierenstein had made the important discovery that in certain individuals quinine might be changed into a highly hæmolytic substance which he calls hæmoquinic acid, and which is found in large quantity in blackwater urine.[4] For the prevention of malaria there was a very general consensus of opinion that quinine had been a failure. He suspected that the prophylactic reputation of quinine depended upon its success in the prevention of relapses. If the failure of true quinine prophylaxis were finally accepted, they would have to rely more than ever on mosquito reduction and mechanical protection.

DEMONSTRATIONS.

Specimens relating to Malaria and Dysentery.

The first demonstration was held in the afternoon of April 9th at the Endsleigh Palace Hotel, the exhibits being prepared by the London School of Tropical Medicine. A series of blood smears illustrated the development of *P. vivax* and *P. malariæ*. The life of *P. falciparum* in the human host was fully demonstrated by smears from the peripheral blood, from bone marrow, and from the spleen, as well as by sections from different visceral organs. The rare condition of schizogony of *P. falciparum* in the peripheral blood appeared in a smear taken in Palestine. The sections were chosen to show how this parasite by its tendency to "clumping" occludes the capillaries of the brain and other viscera. There were bottle specimens of malarial spleens and liver, while the pigmented liver cells might be seen under a microscope. The growth and sporulation of *P. falciparum* in culture was illustrated by microphotographs. Various anophelines were represented in the egg, larval, and adult stages.

At a second demonstration in the Imperial College of Science and Technology on April 11th there were to be seen, in addition to many of the former exhibits, live specimens of culecine and anopheline larvæ and adults, maps and photographs illustrative of their haunts, and a fine minnow which in the time of its captivity at Aldershot had eaten over 100 larvæ a day.

Pathology of Dysentery.

On April 10th Colonel DUDGEON gave a demonstration at St. Thomas's Hospital on the pathology of dysentery and the effects on different tissues of the intramuscular injection of quinine. Several interesting tables gave the results of experimental injection of quinine, the animals selected being mules. Various solvents, as well as different salts of quinine, had been experimented with. In all cases necrosis of muscular tissue had resulted at the site of injection. An interesting feature of these experiments was the rapidity with which the quinine alkaloid or salts was absorbed—e.g., in one case 2·25 g. of the bi-hydrochloride of quinine was injected intramuscularly and the animal killed one hour afterwards. Only 0·938 g. of the salt was recovered from the muscle tissue. The degenerative changes in blood, blood-vessels, nerve and muscle tissue consequent upon intramuscular injection of quinine were demonstrated histologically as well as by coloured plates and post-mortem specimens.

By no means the least interesting of the dysentery exhibits, in view of the previous discussion, were two slides placed side by side of the *Entamœba histolytica* and the *Entamœba coli* in the cystic state. The former, about 10μ in diameter, possessed 4 nuclei having a small centrally placed karyosome within each nuclear ring. The cyst of *E. coli*, on the other hand, was some 20μ in diameter and contained 8 nuclei each with a large coarse karyosome. Other slides showed the active amœbæ and the microscopic pathology of the large intestine. Several bottle specimens of the colon in bacillary and amœbic dysentery with other tangible post-mortem specimens completed the demonstration.

[4] R.A.M.C. Journal, March, 1919.

MEDICINE AND THE LAW.

Dr. A. G. Bateman.

THE announcement of the death of Dr. Bateman will be received with deep regret by a large number of medical men, especially the members of the Medical Defence Union. It is largely owing to his enthusiasm and capacity for work that the Union has been brought to its present state of usefulness and value, not only to the members themselves, but also to the medical profession at large and (although it is not probably realised) to the general public. Dr. Bateman had devoted all his energies for many years to the special work which devolved upon the secretary of the Union, and only those who were brought into constant association with him knew the extent of the knowledge he had accumulated as to the countless questions which were constantly brought before him chiefly on the border-line between medicine and the law. Ever ready to hear the statements of the members and to give advice, his manner in discussing the matter before him at once gave a sense of confidence which appealed favourably to those seeking his counsel. Those practitioners who have been on the council of the Union must have been impressed with the multitude of subjects which Dr. Bateman brought before them, and yet he never seemed at a loss as to the procedure which should be followed. Many of the questions required an immediate decision, either from himself or in consultation with the solicitor to the Union, and could not wait until the next meeting of the council. Dr. Bateman never hesitated to take the responsibility upon himself if delay were impossible, and his subsequent report to the council was invariably followed by the resolution, "Action of secretary approved." He had a charming personality, always cheery and confident, so that it was a pleasure to discuss matters with him, however grave and important the issues might be. During the later years of his life he showed most courageous fortitude in combating grave infirmity of health. His loss will be most severely felt, for his experience was one which had fallen to the lot of few medical men, and it will indeed be difficult to replace him.

Mr. W. E. Hempson, solicitor to the Medical Defence Union, sends us the following tribute of appreciation and regard:—"Dr. A. G. Bateman was a man of strong personality—a many-sided and much-gifted man, and a keen judge of character. I was first brought in touch with him about 27 years ago at a critical period in the history of the Medical Defence Union, and from that time onward to the date of his death we have worked together in the closest harmony and good fellowship. His life was devoted to his work to the exclusion of every other consideration, and there are many who will be ready to admit that through his judicious pilotage through dangerous shoals professional disaster to them has been averted. He was a glutton for work, tenacious of purpose, and impatient of compromise where the professional reputation of a medical man was concerned. His abilities and shrewd detective instincts were seen to best advantage when engaged in tracing out the past history of an unqualified person or a suspected impersonator. In any matter of this nature which he took in hand success was assured, and the records of our criminal courts afford eloquent testimony to this end. It is due to his energies that the Medical Defence Union has been brought to the eminently successful position which it occupies to-day. I write of him as I knew him—a staunch friend and loyal colleague—and with a true sense of the loss which his death means to me."

The Case of De Veulle.

At the Central Criminal Court Reginald de Veulle was recently acquitted, after a long and careful trial, upon the charge of manslaughter of the young actress known as Billie Carleton. Later in the same sessions he was tried on a charge of conspiring to obtain cocaine, convicted, and sentenced to a term of imprisonment. The facts of the case, fully developed at the inquest upon Miss Carleton and before the magistrate, as well as at the Old Bailey, need not be recapitulated. The whole of the squalid story has proved to many who were not aware of it the prevalence of the habit of taking cocaine, the profitable nature of the trade in the drug, and the consequent temptation offered by it to the unscrupulous, and the shifts to which its votaries are prepared to resort in order to obtain it. The stories of Billie Carleton and de Veulle fortunately do not show the results of addiction to cocaine in an attractive light. The publicity given to the fates which respectively have befallen them may, at any rate, have some good result. The death of the former may show foolish young persons that cocaine is not a drug to be lightly trifled with, and that the absorption of it through the nostrils is not quite as safe as snuff-taking. De Veulle also during the period which preceded his acquittal on the charge of manslaughter can hardly have been an object of envy among his former associates. His acts and their result for him will be of public use if they serve to warn others that the law has not forbidden the use of cocaine and then shut its eyes. The indictment of de Veulle upon which he was convicted depended, however, upon a regulation made under the Defence of the Realm Act, which, no doubt, will be preserved in some more permanent form when the declaration of peace threatens to render it inoperative.

Woman and the Legal Profession.

Although practitioners of medicine as a body are not especially concerned with the Barristers and Solicitors (Qualification of Women) Bill many of our readers will follow its fortunes with interest on account of the analogies which the professions of medicine and law present. The relationship was referred to at the annual "Ladies' Night" of the Union Society of London, which took place in the Old Hall of Lincoln's Inn on April 9th, when the proposition that all branches of the legal profession should be open to women was set down for discussion. Miss Normanton, whose efforts to obtain admission to the Bar will be remembered, said that women might display as great capacity for service in the law as they had shown in medicine and nursing—a statement of the case which may be regarded as lacking somewhat in confidence. At a special meeting of the Law Society on March 28th last the way in which the proposed recognition of women's claims might affect solicitors was exhaustively debated, and on this occasion there was made an attempt to draw some conclusions from the results of women's performance in the realms of medicine and the allied arts. One speaker asserted that the number of women doctors was insignificant, and another held that women were not likely to do better as solicitors than as doctors, and that it was consequently improbable "that the solicitor profession would attract women." The vice-president of the society (Mr. W. Arthur Sharp) had been at some pains to learn what had happened in the medical profession as regards the entry of women. He had, he said, been informed by an authority on the General Medical Council that the proportion of women to men on the Register was about 1 to 28—i.e., about 4 per cent. As this represented the fruits of 40 to 50 years he consoled himself with the reflection that there would not be any great influx of women solicitors. The notion that women should be offered something because they will probably *not* accept it does not seem to err on the side of generosity, and the argument that in any case the number who may accept will be so small as to be negligible is an unlucky reading of the maxim *de minimis non curat lex*. But is there any sufficient ground for assuming that the attitude of women towards the professions during the next 50 years will be the same as in the past? The indications appear to point quite in the opposite direction. Even allowing for war conditions the ratio of women to men at the qualifying examinations is steadily increasing. A similar state of things is found in pharmacy, where the proportion of female candidates has become very high, though of the names in the registers of chemists and druggists and of pharmaceutical chemists only about 5 per cent. are those of women. If the lawyers are to draw any inferences from the experience of their medical brethren it seems to be that equality of opportunity enables women to find their level with benefit to the community.

The Trial of Colonel Rutherford.

Lieutenant-Colonel N. C. Rutherford, D.S.O., R.A.M.C., has been brought to trial at the Central Criminal Court for the murder of Major M. C. C. Seton, R.A.M.C., and found guilty but insane, their deliberations only occupying the jury for a space of five minutes. The case has attracted attention ever since Jan. 13th, when the crime was committed, and the proceedings at the inquest and before the magistrate have made everyone interested in such matters familiar with the details of the shooting of Major Seton. The nature of the defence was not unexpected by those who considered the circumstances in which the act was committed, the apparent absence of motive, the manner in which the act was performed, and the conduct of the prisoner immediately afterwards. At the Old Bailey witnesses were called for the first time, and the evidence of Dr. T. B. Hyslop and Dr. F. H. Edwards left no doubt as to what the finding of the jury must be. These had been preceded by others who showed that the family history of the prisoner included at least one near relative unquestionably insane, and also that the mental condition in which Colonel Rutherford was when he shot Major Seton had developed during a period of many years. Medical colleagues who were able to recall conduct which they recognised in the light of the final act of bloodshed as symptomatic of mental instability included one who had been a fellow-student with the prisoner at Edinburgh so long ago as 1898. The judge's expression of agreement with the jury's verdict should find no dissent on the part of the medical profession. The case is not one of those which at times arouse controversy as to the proper application of the rule founded upon what is known as McNaughton's case, and any other verdict, after the evidence given, could never have been followed by the carrying out of a sentence of death.

The Case of Dr. Marcus Woolf Cohen.

At the London Quarter and General Sessions at the Sessions House, Clerkenwell, Dr. Marcus Woolf Cohen, of 100, Commercial-road, E., on April 8th successfully appealed against his conviction at the Thames police-court on Jan. 6th last, under the Defence of the Realm Regulations, for giving a false medical certificate. After the case for the prosecution opposing the appeal had been heard, Dr. Cohen gave evidence in support of the appeal, when the court expressed itself satisfied, stopped the further hearing of the case, formally allowed the appeal, and quashed the conviction and fine. Mr. Hawke, K.C., and Mr. Huntley Jenkins, instructed by Messrs. Le Brasseur and Oakley as solicitors for the London and Counties Medical Protection Society Limited, appeared for Dr. Cohen.

AUSTRALIA.

(FROM OUR OWN CORRESPONDENT.)

The Influenza Epidemic.

WITH the cessation of fresh cases on oversea steamers and the non-appearance of any shore extension it was hoped and believed that the efforts of the Federal quarantine authorities to keep out influenza were to be crowned with complete success. On Jan. 20th two of the general hospitals in Melbourne began to receive cases in unusual numbers presenting suspicious symptoms. On Jan. 23rd the superintendent at the Melbourne Hospital drew attention in the morning papers to this development. Some of the patients were examined by a medical officer who had seen cases in quarantine and his opinion was that they were not pneumonic influenza. On Jan. 26th the Victorian State Health Department still hesitated to declare that the State was infected. On that date, however, the New South Wales authorities declared that cases of pneumonic influenza had been discovered in Sydney which had come from Melbourne, and asked that N.S.W. should be declared in quarantine. On Jan. 28th Victoria also asked to be declared an infected State. Since that date there has been a very definite outbreak of a disease corresponding in all its clinical and epidemiological features to the pandemic influenza of the past year. Up till Feb. 7th there were some 100 deaths reported, but the system of notification seems at fault, and it is probable the number of persons attacked greatly exceeds the official figures and that deaths occurring in private practice are not accurately sifted. Upwards of 2000 cases have been notified. The Melbourne experience has not differed from that of any other large centre. There has been the same sudden strain on existing hospital accommodation and the same unpreparedness for a rapid extension of hospital facilities. Temporary hospitals have been provided and some of the general hospitals have devoted practically all their space to influenza cases. The general preventive measures have been directed to prevent crowding of people either indoors or out-of-doors. Theatres and picture shows have been closed, church services are only allowed if the congregation wear masks, all race meetings have been prohibited, and generally the public have been appealed to keep apart. It cannot be said that these provisions are of very much avail, as the sea fronts and beaches are as crowded as ever on hot nights, but they have served to bring home the seriousness of the position and have been quietly accepted. The administrative control is in the hands of the State Health Department and an advisory committee of medical men.

Inoculation and Masks.

From the first indication of the danger of epidemic influenza the Commonwealth Quarantine Department issued a vaccine and recommended its general use. Considerable numbers of persons were inoculated about six weeks ago, and many thousands since the outbreak became severe. The inoculation was a mixed vaccine in two strengths, given at an interval of one week. Medical opinion has been very divided as to the value of this procedure, but it caught the public fancy and has been widely adopted. At present there is no evidence that it has any effect at all. Some early enthusiasts have been shaken by the fact that the hospital nurses and residents have been very numerously stricken, and a curious experience has occurred in the case of a Catholic orphanage school. Two hundred boys and teachers were inoculated, and on the sixth day after the first dose there was a most sudden and dramatic outbreak of influenza. One hundred and twelve boys were smitten the same day, some while in the playground, and cases are developing every day. The question of wearing masks has also been put to practical test. The Health Department require masks to be worn in church, and the first few days of panic induced many persons to appear in gauze masks in the streets. The advisory committee declined to advise that the mask should be made compulsory, and in two or three days the mask disappeared from the streets. On the other hand, the mask is compulsory in Sydney. If we may judge from the numbers of nurses who have found masks no protection, it is doubtful if the general public will get any safeguard. Already in Victoria the deaths of two nurses and two doctors have occurred as a result of the disease, the nurses having been infected in hospital and the practitioners outside.

Unseemly Disputes.

Last November a conference of Federal and State health officials was held, at which it was agreed that in the event of an outbreak of epidemic influenza occurring in any State a certain joint action should follow automatically under the general direction of the Federal quarantine authority. When the first suspicious cases were under observation in Victoria the Premier of New South Wales was in Melbourne. He at once left for Sydney by special train, and a day later New South Wales declared itself infected and refused to allow any ingress from Victoria except under her own regulations. The Federal department was by this means ignored, and the agreement made at the conference was repudiated. This very unsatisfactory position still continues, and has been imitated by Queensland and Western Australia. As a consequence, a number of residents from these States are stranded in Melbourne and cannot reach their homes. Apart from the public health aspect, this action has raised a grave political situation, which threatens to give rise to much unpleasantness between Federal and State Governments. New South Wales and South Australia are now infected, while Queensland and Tasmania remain free.

Feb. 11th.

Public Health.

ANNUAL REPORT OF THE DEPARTMENT OF PUBLIC HEALTH, EGYPT, 1916.*

IN an introductory note Sir David Semple, the Director-General of the Department, states that this report is merely a summary of the work carried out during 1916, as, on account of the war, the staff has been greatly diminished. The population of Egypt is stated as 11,955,821 Egyptians and 188,390 "foreigners"; for the former the birth-rate was 42·2, and the death-rate 31·3 per 1000; the death-rate for foreigners was 11·3 per 1000; this latter figure does not include deaths among the abnormal military forces temporarily present in the country. The death-rate among foreigners in Cairo was 10·0, and in Alexandria 12·4 per 1000. Since the beginning of the war 28,284 military patients have been admitted to the Government general hospitals, of whom 396 died and 1471 were invalided to England. The total number of patients treated in these general hospitals was 55,489, the cost of upkeep being 123,379 *livres Egyptiennes*, and the average cost per bed being 32·256 *livres Egyptiennes*. Two new blocks have been added to the Abbassiya Infectious Hospital, near Cairo, which is, however, still much too small for the requirements of such a large city. There are six training schools for native midwives, which are doing very good work; 130 *dayas* were trained during the year, and it is stated that the candidates for these training schools are improving in type; the schools, besides training these pupils in midwifery, are also educational centres, and reach a class of girls that do not attend the ordinary schools. It is hoped that, in connexion with the medical college for women proposed to be started in Cairo as a Kitchener memorial, there may also be a hospital for women, which would provide clinical material for the proposed college. Another important work is that of the dispensaries for children, of which there are 12 throughout the various provinces, attended by 390,810 cases for treatment, a great increase on the attendances for the previous year (255,082). As regards infectious diseases there was a considerable increase in typhus fever, 30,507 cases and 7095 deaths being recorded, mostly in Lower Egypt; this prevalence was greatly in excess of that in 1915 (17,096 cases and 4216 deaths), which in its turn was higher than in any recent year. Most cases occurred in Lower Egypt. Relapsing fever (10,494 cases and 826 deaths) was also very much more prevalent than in any recent year. The increase in these two diseases is ascribed partly to depletion of the staff for war work, and partly to movement of native labourers employed on military works. Plague (1702 cases and 828 deaths) was more prevalent than in recent years, though not so fatal as in 1907 and 1911. Cholera broke out among the troops in the Sinai peninsula, as the result of the occupation of territory previously occupied by the Turks; there were 15 cases and

* Cairo Government Press, 1918.

2 deaths, the disease being suppressed by the energetic and efficient action of the military medical authorities; no case occurred west of the Canal. A small outbreak of "paracholera" occurred in a military convalescent hospital in Alexandria, apparently caused by a carrier from Mesopotamia. There were 60 cases, but no deaths. Steps have been taken towards arriving at an accepted definition of this disease, and the international measures that should be adopted in regard to its prevention. This report, though very brief, is the record of an immense amount of skilled work of the highest value. With the exception of Sir David Semple's introductory note it is absolutely anonymous.

REPORTS AND NOTES OF THE PUBLIC HEALTH LABORATORIES, CAIRO.*

This publication consists of several valuable records of original research work carried out during recent years, and now made available for all concerned with the prevention of disease and health administration in tropical and subtropical countries. Mr. E. Beaton describes the results of bacteriological examination in 1827 cases of suspected enterica among British troops from September, 1915, to April, 1916; blood cultures were examined by Conradi's method, fæces and urine with Endo's reduced fuchsin medium. In all 1827 cases were examined; in 387 the results were positive; *B. typhosus* was found in 30 cases, paratyphoid A in 283, and paratyphoid B in 74; in addition there were found 5 cases of double infection. Out of 1188 cases examined by blood culture 19 per cent. were positive. Of those examined in the first week 33 per cent., and of those in the second week 17 per cent. were positive; in the third week only 9 per cent., and later than this only 7 per cent. were positive; but, as is pointed out, the cases were "undoubtedly not all cases of enterica, and it is impossible to ascertain the number to be excluded on this basis." In most instances it was not recorded whether the disease had been contracted in Egypt or in Gallipoli, but in 62 cases this could be ascertained. Of 22 cases from Gallipoli, 82 per cent. had been infected with paratyphoid A and 18 per cent. with paratyphoid B; there was no infection with typhoid bacillus. Of 40 cases occurring in Egypt, 87·5 per cent. were infected with paratyphoid A, 7·5 per cent. with paratyphoid B, and 5 per cent. with the typhoid bacillus; before the war both paratyphoid infections were very uncommon, compared with true enteric. An account is given of the work of the Institut Antirabique at Cairo by the director, M. Pierre de Vregille. Since its establishment in 1899 under Dr. Tonin up to 1906 there had been 2089 cases of dog-bite regularly treated; the deaths were 12 (0·5 per cent.). Six of these deaths occurred in 343 persons bitten by animals proved to be rabid by veterinary examination (1·7 per cent.); 6 deaths occurred in 1610 persons bitten by animals suspected to be rabid (0·3 per cent.); and of 136 persons bitten by dogs proved to be rabid by laboratory inoculation tests or by rabies development in other animals bitten, none died. In 1906 the institute was taken over by the Government Public Health Administration. From April, 1906, to the end of 1916 the number of persons regularly treated was 5973; the total number of deaths was 142 (2·37 per cent.), but of these 95 occurred during the treatment or within 15 days after. Cases of rabies developing more than 15 days after termination of treatment (i.e., real failures) only numbered 47 (0·78 per cent.). This record is one of great interest and importance, and is described in the fullest detail and illustrated by numerous tables. There are also memoirs on filarial infection in a village near Giza, by Mr. Charles Todd, the director of the Public Health Laboratories, and Mr. R. G. White, and on the composition of cow and buffalo and goat's milk and lettuce oil, by Mr. Todd and Messrs. Hogan and Griffiths-Jones.

A CHILDREN'S HOSPITAL FOR BERMONDSEY.—A club for girls, which was founded by Princess Marie Louise in Jamaica-road, Bermondsey, has during the war been used as a hospital for wounded soldiers. When the hospital is given up by the military authorities it will be turned into a children's hospital, and will be known as the Princess Club Hospital for Children. Funds are being raised towards the initial expenses and upkeep.

Correspondence.

"Audi alteram partem."

HILUS TUBERCULOSIS IN CHILDREN AND ADULTS.

To the Editor of THE LANCET.

SIR,—In THE LANCET of Feb. 8th appeared a most interesting paper by Dr. Clive Riviere on "Hilus Tuberculosis in the Adult." In 1917 I presented a brief report to the Worcestershire County Council on cases of this nature occurring in soldiers, and referred their origin to childhood. For the last 14 years I have watched many hundred such cases develop, and I can confirm, in the main, the description of signs and symptoms given by Dr. Riviere.

But there are two important and constant signs which I should like to add to his description—namely, (1) flattening, and change of percussion note and sensation, on palpation at the lower part of the back, and (2) bilateral, subclavicular flattening. The common history of the cases is as follows:—

A child is seen at 5 or 6 years of age. At this age he is typically plump and in good condition, except that he tires quickly and "catches" frequent "colds." On examination, he has a slow pulse, a raised temperature (100° to 101° F. during much of the day); sweats at night for weeks whenever he has a "cold"; and gets "bronchitis" every winter. He loses weight for a month or two at a time, and gains in an irregular manner. At one or other base crepitations are audible. There may be areas of defective air-entry, or, if not at first present, they will arise within the next few years. The areas where crepitations are to be heard vary from month to month. I have often had children whom I have examined every few months for years, and in some the area of crepitations has never been twice the same. Areas of bronchial breathing will be found from time to time, as variable in locality as the other signs, but always at the back.

If the case goes on well, two fresh signs appear.

Over the lower part of the back, over the area of disease, there is flattening; generally this is visible first on one side, and then on both. Or, in rare cases, the change remains mainly on one side. In addition, there is a change on percussion. To a certain extent this change is a change in note, a deadening of the sound. But, even more, it is a change which can be felt. It can also be ascertained by direct tapping with the finger-tips, and in many cases I find this to be the most certain method of estimating the rate of change in children seen frequently. The changed sensation is due to a definite hardening of the muscle beneath, and I believe it to be due to that structural alteration in the muscle which has been shown to occur in muscle over tubercular lung. There is a definite loss of elasticity, and the muscle has lost its resilience. The sensation conveyed to the finger tips is so definite that I have often correctly remarked that diseased lung was beneath before auscultation. In addition, there are generally present fairly wide areas of more or less defective air-entry, in the same region.

The second sign, which occurs in children who are fighting the disease successfully, is a bilateral subclavicular flattening. This is due to the backward and downward pull of fibrotic bands in the lung, connecting the healthy upper lobes with the healing and contracting areas at the base. There is no impairment of note and no alteration to palpation. These bands can be well seen in some radiographs.

If these two changes do not take place by the age of 12 or 14 the disease is not in process of arrest. Gradually signs of disease would appear, still at the back, in the upper parts of the lungs. There will be areas with increased transmission of voice sounds, bronchial breathing, and crepitations. At the same time symptoms of disease will become more definite. This stage may go on for years. Then other signs will appear in the front of the chest and the patient is said to have phthisis.

In the great majority of children hilus disease tends of itself to arrest, but in many cases the disease has been allowed to extend so widely that it has caused two permanent effects: (1) stunting of growth; (2) a loss of elasticity in the lung, in severe cases a considerable proportion of the lung being left fibrotic and useless. If the child becomes rheumatic the lung tuberculosis is arrested.

In a considerable number of cases the disease does not entirely quiesce. Exposure to hardship causes recrudescence,

and the lessened lung surface available for work causes such persons to be less efficient when under physical strain.

Many of these cases remain undiagnosed owing to the absence of the typical apical signs. On the other hand, the subclavicular flattening is often diagnosed to mean recent local disease.

I am, Sir, yours faithfully,

Colwall, April 5th, 1919. MARY H. WILLIAMS.

HOT LIQUIDS AND CANCER.

To the Editor of THE LANCET.

SIR,—May I remind Dr. M. J. Petty of my investigations into the habits of persons dying of cancer in this borough reported in THE LANCET of Oct. 12th last? No excess of cancer of the mouth and throat was recorded among excessive tea-drinkers, but an excess of 70 per cent. among excessive smokers. Perhaps the explanation is that the irritant acts during a much shorter period in drinking than in smoking.

I am, Sir, yours faithfully,

SIDNEY DAVIES,
Medical Officer of Health, Woolwich.

April 9th, 1919.

WOMEN CHIEFS?

To the Editor of THE LANCET.

SIR,—Dr. Claude Lillingston's query in his letter in your issue of April 12th as to promotion of a male medical municipal employee "with the mentality of a monkey," over a female one "with vision, tact, and administrative genius," must remain unanswered, for I have never met the former type, and think it impossible. But I do not want to take this rhetoric at the foot of the letter. To the principle of promotion by merit, irrespective of sex, I, of course, subscribe; only I believe promotion by real merit (not promotion to placate agitators) must always work out in favour of the man—because, first, there are so many more males to choose from; and second, administrative talent is so much commoner in men than in women. The challenger of the latter proposition may be referred to current authorities on psychical secondary sexual characters. Thus with regard to our present subject, higher administrative posts in a scientific service, Havelock Ellis quotes a paper by Mr. C. H. Garland, in which it is recorded that in Italy women appointed to high grade posts in the telegraph service are found to lack authority over their staffs, to be wanting in judgment and decision, and unable to apply effectively the technical knowledge they possess. "The characteristics thus revealed resemble those found in England." The Austrian administration considered women unsatisfactory in the higher grades, not having sufficient energy to obtain authority over other persons, so that it is always necessary to entrust the surveillance of women to men. Elsewhere failure in face of emergencies is mentioned. Belgium no longer receives women into the service, as also Germany. My friend, Dr. Lillingston, writes of administrative genius in women, but he is not supported by scientific sexuologists. Their findings on this head I always think well summarised in Mr. George Moore's sonorous sentence (surely without real offence): "Women have succeeded as actresses, and as courtesans, and as saints; most of all as saints. They worship worthily the gods that men have created." Woman, in short, displays genius only in certain emotional spheres, not in action.

A shrewd realisation of all this is surely behind the connotations of the common phrase, "petticoat government." That phrase betokens a definite public opinion of which practical politicians will take good note. Just recently a regular trades'-union like the N.U.T. protested against a young male teacher being made to serve under a head mistress. I fancy a great many male doctors do not want petticoat government, which is why I ventured to predict trouble from the introduction into municipal medicine, especially when the bond and the bargain binding upon employees had no mention of it.

I am, Sir, yours faithfully,

April 12th, 1919. W. C. RIVERS.

TUBERCULOSIS SOCIETY.—An address will be given by Dr. Halliday Sutherland, at the House of the Royal Society of Medicine, on April 28th, at 8.30 P.M., on "Tuberculosis Officers and Panel Practitioners."

The War and After.

THE CASUALTY LIST.

THE names of the following medical officers appear among the casualties announced since our last issue:—

Died.

Lt.-Col. J. G. Hojel, C.I.E., I.M.S., qualified in Ireland in 1887. Prior to the war he was civil surgeon at Ahmednagar, and at the time of his death from heart failure he was officer commanding the Lady Hardinge War Hospital, Bombay.

Capt. W. S. Browne, R.A.M.C.

Missing.

Major F. M. Taylor, R.A.M.C.

Wounded.

Lieut. S. L. Bhandari, I.M.S.

CASUALTIES AMONG THE SONS OF MEDICAL MEN.

The following additional casualty among the sons of medical men is reported:—

Capt. A. W. P. Peddie, 1st Lincs. Regt., previously reported missing and wounded in September, 1914, now presumed killed in action at that time, eldest son of Dr. H. A. Peddie, of Edinburgh.

MENTIONED IN DESPATCHES.

In a final despatch describing the advance of the British forces into Germany, and briefly reviewing the chief features of military interest in the operations of the British Armies on the Western front during the period of his command, Field-Marshal Sir Douglas Haig makes the following mention of the medical services:—

"The achievements of the Director-General of Medical Services and his subordinates have been so fully recorded by me in previous despatches that they need no further emphasis. It is sufficient to say that, in spite of the numbers dealt with, there has been no war in which the resources of science have been utilised so generously and successfully for the prevention of disease, or for the quick evacuation and careful tending of the sick and wounded."

He also bears testimony to the efficient work done by his Directors of Medical Services past and present—namely, Surgeon-General Sir A. T. Sloggett and Lieutenant-General C. H. Burtchaell, with their deputies, Surgeon-General Sir W. G. Macpherson and Major-General J. Thomson.

RED CROSS AMBULANCES FOR HOME SERVICE: A COUNTY SCHEME DECIDED UPON.

The whole of the great Red Cross fleet of motor ambulances is not to be dispersed with the coming of peace. About 500 of the ambulances will be available for service at home under a county scheme. The Joint War Committee of the British Red Cross Society and the Order of St. John has appointed a Home Service Ambulance Committee to control and work the scheme for a period of 12 months. At the end of that period the scheme will come up again for consideration, as, being in the nature of an experiment, it is hoped that during the 12 months much valuable and practical information will be at the disposal of the committee. The Home Service Ambulance Committee consists of Sir Arthur Stanley (chairman), Sir Ernest M. Clark (vice-chairman), General the Earl of Cavan, Sir Mackenzie D. Chalmers, Viscount Chilston, the Earl of Donoughmore, the Earl of Ranfurly, Mr. J. W. Orde, Captain George Warre, and Dr. Dawson Williams. The secretary is Mr. F. C. Davies, 83, Pall Mall, London, S.W. 1.

The committee desire to centralise through the county directors the control and working of the scheme, of which details have now been issued to all county directors in England, Wales, and Ireland. The county directors will decide at what towns or villages in their area ambulances are to be stationed, and it is the desire of the committee to satisfy the needs of county districts before considering applications from great towns. The committee hope that each county director will set up a small committee to operate and control the ambulances in his area. It is suggested that a charge should be made for the use of an ambulance. Such charge will naturally vary in different counties and the committee suggest a fee of 1*s.* 3*d.* per mile, the county

director, or the suggested county committee, having power to remit the charge in cases of emergency or when the circumstances of the patient make it desirable. Infectious cases may be carried at the request of the local authority, who must be responsible for the payment of the charge and for the efficient disinfecting of the ambulance after use.

It is hoped that county directors when deciding the locality for placing ambulances will endeavour—in coöperation with the directors of neighbouring counties—to arrange that the ambulances are placed approximately 30 miles apart so that, when needed, one will always be available not more that 15 miles away, say, about an hour's run. All the ambulances are fitted with the standard War Office type body, and are capable of taking four stretcher cases or eight sitters.

All applications will be dealt with in the order of receipt and will be satisfied as early as possible, but dependent upon the arrivals of demobilised cars from oversea.

WAR EMERGENCY FUND OF THE R.M.B.F.—At a meeting of the executive committee of the fund held on April 4th, Lieut.-Colonel Sir Alfred Pearce Gould in the chair, several applications for assistance were received, and grants amounting to £1710 were made. Applications for assistance, marked confidential, should be addressed to the Honorary Secretary, 11, Chandos-street, London, W. 1.

THE SERVICES.

ARMY MEDICAL SERVICE.

Temp. Col. T. H. Openshaw (Lieutenant-Colonel, R.A.M.C., T.F.) relinquishes his temporary commission on re-posting.

TERRITORIAL FORCE.

Lieut.-Col. H. D. Brook, from R.A.M.C. (T.F.), to be Colonel.

ROYAL ARMY MEDICAL CORPS.

Lieut.-Col. C. J. O'Gorman to be acting Colonel whilst employed as A.D.M.S. of a Division.

Temp. Lieut.-Col. J. Patrick (Captain, R.A.M.C., T.F.) relinquishes his temporary commission on re-posting.

The undermentioned relinquish the acting rank of Lieutenant-Colonel on re-posting: Majors G. A. D. Harvey, R. B. Ainsworth, A. N. Fraser, J. S. Bostock (and Bt. Col.), J. W. Kynaston; Temp. Capts. R. B. Drake-Brockman, R. Svensson.

Capt. (acting Major) J. F. Robertson to be acting Lieutenant-Colonel whilst in command of a Medical Unit.

To be acting Lieutenant-Colonels whilst specially employed: Major and Bt. Lieut.-Col. Sylvester-Bradley; Major R. B. Ainsworth; Temp. Major C. M. Row.

The undermentioned relinquish the acting rank of Major on re-posting: Capt. C. Scales; Temp. Capts. A. Fullerton, G. A. Lilly, E. W. Sheaf, G. D. Eccles, J. C. Sale, C. F. Strange, E. G. Stanley, G. W. Smith, J. Jack, W. B. G. Angus, R. M. Greig, T. B. Batchelor, H. B. Wilson, C. Mackenzie, A. H. Spicer, H. H. Sampson, G. L. Keynes, H. Pringle, J. C. L. Day, J. C. Muir, A. H. M. Robertson.

To be acting Majors whilst specially employed: Capt. C. M. Rigby; Temp. Capts. C. J. L. Patch, B. H. Woodyatt, R. C. MacQueen, P. M. Heath.

Major H. O. M. Beadnell is placed temporarily on the Half-pay List on account of ill-health.

Temp. Capt. H. J. de Brent relinquishes the acting rank of Major.

Temporary Captains to be acting Majors: A. W. D. Coventon, F. P. Young, G. R. B. Purce, W. C. Horton, J. R. Collins, R. A. Steven.

Officers relinquishing their commissions:—Temp. Majors J. C. MacNeillie, M. B. Wright, and A. M. Humphry retain the rank of Major. Temp. Hon. Major J. Baker, on ceasing to be employed at Crowthorne War Hospital. Temp. Hon. Major A. de W. Snowden retains rank of Major. Temp. Capts. R. Svensson and H. Stokes granted the rank of Lieutenant-Colonel. Temporary Captains granted the rank of Major: H. G. Willis, G. D. Mathewson, E. C. Lindsay, C. Mackenzie, P. Morgan, R. E. Gibson (acting Major), J. E. Pellow, H. B. Walker, V. M. Rich, H. Hodge, H. A. L. Banham, W. R. P. McNeight, G. T. Gifford, W. E. Gemmell, J. G. Murray, J. Philp, T. T. Higgins, J. N. Wheeler, N. A. A. Hughes, W. B. C. Angus, W. S. Edmond, C. H. Corbett. Temporary Captains retaining the rank of Captain: J. C. Muir, E. L. Holland, W. Hamilton, E. F. G. T. Heap, S. B. Hanbury, M. Hallam, A. Hunter, M. Hall, D. C. Hanson, J. B. H. Holroyd, A. W. Holthusen, R. C. Hutchinson, W. T. Hardie, E. C. Hardwicke, H. W. Horan, F. J. Henry, H. Holt, J. D. Hartley, F. G. Hack, K. G. Haig, A. J. P. Nowell, D. Martin, C. M. Roberts, G. E. E. Nicholls, G. Mowat, G. F. Petrie, W. St. C. McClure, H. F. Overend, A. M. Warwick, R. A. MacNeill, A. R. P. Scott, J. H. P. Vivian, W. E. Barrett, R. Alderson, H. Speirs, W. Murray, W. R. Snodgrass, G. J. Arnold, E. A. Walker, A. A. Murison, W. Rigby, G. L. Pillans, A. Wilson, C. F. Rumsey, J. Porter, B. C. Scott, R. A. H. Atkinson, G. H. Baird, G. J. Knaggs, C. S. Cato, D. J. O'Brien, E. W. D. Hardy, D. M. Humby, H. R. Phillips, R. M. Handfield-Jones, M. T. D. McMurrich, J. J. Keymes, B. B. Westlake, T. J. George, A. Ramsay, D. W. Woodruff, C. de Chanval Pellier, T. R. Trounce, F. L. Napier, C. Stuart, J. A. Currell, R. W. Willcocks, H. S. Groves, L. M. Scott, W. H. O'Heffernan, P. Sturrock, R. J. Johnston, V. E. Negus, J. Raffan, M. E. A. Wallis, W. P. S. Johnson, W. S. McGowan, C. Gordon, R. H. Hodges, W. Gilbertson, A. C. Falkiner, A. C. W. Knox, H. M. Moir, W. Murray, J. T. Kyle, J. S. Crawford, E. M. Lithgow, C. M. Dickinson, W. Herbertson, A. B. Porteous, G. D. Eccles, E. F. N. Currey, G. B. Macgregor, A. Gray, C. M. Ockwell, A. B. Cluckie, R. L. Ferguson, S. G. Johnson, T. Gillespie, J. Grogono, R. N. Woodsend, W. H. Pearse, J. Ogilvie, R. L. Blenkhorn, R. M. Wright, H. W. Barnes, N. Campbell, D. C. Welsh, R. H. Tribe, D. T. Skeen, A. W. Young, T. S. Wright, A. B. Simpson, T. W. Wadsworth, J. W. Burns, J. H. Cuthbert, L. Game, R. W. Stocks, P. Bowes, D. G. Gardiner, E. Scott, R. Stansfield, W. Waddell, W. E. H. Beard, E. Fullerton, W. M. Christie, J. Smith, B. O. Kinney, W. E. A. Buchanan, W. A. Troop, C. G. Lowry, A. Dingwall-Fordyce, C. S. E. Wright, E. H. Freeland, H. A. Williams, F. L. Webster, W. A. Murray, F. T. Simpson, T. W. Ruttledge, J. W. B. Hanington, C. McShane, F. M. P. Rice, C. S. O'Neill, D. Ferguson, G. R. Hannon, D. T. Harris, G. McMullan, T. J. Foot, R. A. Fawcus, J. G. M. Molony, C. C. Marston, D. J. Lewis, A. F. R. Conder, F. J. Cairns, S. W. Green, F. E. Wilson, S. D. Fairweather, C. W. Emlyn, J. M. Inverarity, R. J. Willson, N. G. W. Davidson, C. V. Kebbell, C. H. Graham, F. G. H. Cooke, J. G. Morrin, A. E. Druitt, W. Gibson, W. N. May, C. C. Finlator, G. Newstead, T. S. McIntosh, G. C. M. M'Gonigle, T. W. Jackson, A. Bisset, B. A. I. Peters, B. W. Housman, D. L. Williams, A. D. Buchanan, H. W. Webb, A. Thomson. Temp. Hon. Capt. H. J. Foulerton. Temporary Honorary Captains retaining the honorary rank of Captain: G. S. Peppers, R. P. Mitchell. Temporary Lieutenants retaining the rank of Lieutenant: E. J. F. Hardenberg, J. Dewar, A. T. Denshaw, G. Smith, F. M. Fellows, C. A. Basker, R. Rae.

Canadian Army Medical Corps.

Temp. Lieut.-Col. C. P. Templeton to be acting Colonel while holding appointment of A.D.M.S.

Temp. Lieut.-Col. J. Hayes to command No. 2 Canadian Stationary Hospital.

Temp. Capt. F. T. Campbell to be acting Major.

Temp. Capt. (acting Major) G. Bouthbellier retains the acting rank of Major while employed at Canadian Special Hospital, Witley.

Canadian Army Dental Corps.

Temp. Capt. E. Kelly to be temporary Major.

South African Medical Corps.

F. P. G. de Smidt, late temporary Captain, is granted the rank of Captain.

SPECIAL RESERVE OF OFFICERS.

Capt. J. J. Finlay relinquishes his commission and retains the rank of Captain.

Capt. C. J. A. Griffin relinquishes the acting rank of Lieutenant-Colonel on re-posting.

Captains relinquish the acting rank of Major on re-posting: Bt. Major L. W. O. Taylor, H. G. Crawford, C. H. G. Penny, P. J. Gaffikin, W. S. Haydock, G. F. P. Gibbons, D. C. Macdonald, L. S. B. Tasker, J. Rafter, G. V. Stockdale, W. C. Mackie, and A. R. Dale.

Capt. J. Inkster to be acting Major.

TERRITORIAL FORCE.

General List.—Majors (acting Lieut.-Cols.) A. E. Kidd, W. G. Sutcliffe relinquish their acting rank on ceasing to be specially employed.

Major A. Milne-Thomson to be acting Lieutenant-Colonel whilst specially employed.

Capts. (acting Lieut.-Cols.) F. L. A. Greaves, H. N. Burroughes relinquish their acting rank on ceasing to be specially employed.

Capts. (acting Majors) R. G. Dixon, V. H. Wardle, H. B. Pope, J. R. Menzies, R. E lis, H. B. F. Dixon relinquish their acting rank on ceasing to be specially employed.

Capt. H. E. Marsden relinquishes his commission, and retains the rank of Captain.

Captains to be acting Majors whilst specially employed: J. G. McKinlay, W. J. T. Kimber.

Capt. L. C. Bruce is restored to the establishment on ceasing to hold a temporary commission in the R.A.M.C.

1st Eastern General Hospital: Capt. H. A. Cookson is restored to the establishment.

1st Northern General Hospital: Lieut.-Col. W. E. Hume is restored to the establishment.

5th Northern General Hospital: Capt. T. C. Clare is restored to the establishment.

2nd Scottish General Hospital: Major F. D. Boyd is restored to the establishment on ceasing to hold a temporary commission in the Army Medical Service.

4th Southern General Hospital: Capt. C. L. Lander is restored to the establishment.

5th Southern General Hospital: Capt. (acting Major) J. Blackwood to be acting Lieutenant-Colonel whilst specially employed and to remain seconded.

1st London Sanitary Company: Lieut. T. Edwardes to be Captain.

3rd Wessex Field Ambulance: Lieut.-Col. (temp. Col.) H. D. Brook relinquishes his temporary rank on vacating the appointment of Assistant Director of Medical Service and is restored to the establishment.

1st London General Hospital: Capt. (acting Major) J. H. Thursfield relinquishes his acting rank on ceasing to be specially employed and remains seconded.

3rd Southern General Hospital: Capt. G. R. Girdlestone is seconded for service with a Special Military Surgical Hospital.

2nd London General Hospital: Capt. A. S. Daly is restored to the establishment.

ROYAL AIR FORCE.

Medical Branch.—Capt. J. S. Dockrill (R.A.M.C.) is granted a temporary commission as Captain.

N. S. Gilchrist (temporary Captain, R.A.M.C.) is granted a temporary commission as Captain.

Lieut.-Col. W. H. Pope (R.N.) relinquishes his commission on ceasing to be employed.

The undermentioned are transferred to the Unemployed List: Capts. A. B. Lindsay, C. L. Birmingham, C. W. W. James, C. F. Hereford.

Dental Branch.—Second Lieut. D. Campbell is transferred to Unemployed List.

Parliamentary Intelligence.

NOTES ON CURRENT TOPICS.

Medical Inspection and Treatment of Irish Children.

THE Public Health (Medical Treatment of Children) (Ireland) Bill was considered by a Grand Committee of the House of Commons on Wednesday, April 9th. Colonel NICHOLSON was in the chair. The Bill provides for medical inspection and treatment of children attending the national schools in Ireland.

Mr. LYNN moved an amendment to the effect that urban and rural district councils should be added to the local authorities for the purposes of the Act.—Mr. SAMUELS (Attorney-General for Ireland) resisted the amendment, remarking that the county would appoint one or two or perhaps three men to do the work. They could do it efficiently, but if it were left to 60 or 70 rural district councils that would not be the case.

The amendment was ultimately withdrawn in favour of one moved by Mr. SAMUELS giving the Local Government Board power to appoint an urban district council an authority under the Act in areas of not less than 6000 population, which was agreed to.

Mr. SAMUELS accepted an amendment moved by Major O'NEILL to the effect that if the local authority failed to perform its duties the Local Government Board might appoint someone to discharge such duties as it might specify, the expenses of remuneration being defrayed by the local authority.—The amendment was agreed to.

Mr. MOLES moved an amendment prescribing that the expression "elementary school" meant a school recognised by the Commission of National Education in Ireland in the place of the provision in the Bill defining the expression as a school recognised by the Local Government Board The latter body, he said, had nothing to do with education.—Mr. SAMUELS resisted the amendment. He pointed out that the wording of the Bill followed that of the Feeding of School Children Act.—The amendment was negatived, and the Bill as amended was reported to the House.

Nurses' Registration Bill.

The Nurses' Registration Bill was further considered by a Standing Committee of the House of Commons on Thursday, April 10th, Mr. D. MACMASTER was in the chair. The Committee resumed discussion of the constitution of the proposed General Nursing Council.

Sir KINGSLEY WOOD, in the absence of Dr. ADDISON (the President of the Local Government Board), moved as an amendment that the General Nursing Council should be composed as follows: "Eighteen women nurses, of whom eight shall be resident in England, two in Wales, four in Scotland, and four in Ireland, to be nominated subject to the approval of the Local Government Board for England and Wales, the Local Government Board for Scotland, and the Local Government Board for Ireland respectively—by the following bodies and with the following numbers—one by the Queen Victoria Jubilee Institute for Nurses, one by the Asylum Workers' Association, one by the North Wales and South Wales Nursing Associations, four by the Royal British Nurses' Association, four by the College of Nursing (Limited), and seven representing the following: Society of Trained Nurses, by the Central Committee for the State Registration of Nurses, the Matrons' Council of Great Britain and Ireland, the Society for the State Registration of Trained Nurses, the National Union of Trained Nurses, the Fever Nurses' Association, the Scottish Nurses' Association, the Irish Nurses' Association, and the Irish Nursing Board." He stated that the amendment was framed with an earnest desire to meet the wishes of all the interests affected, and the public, too, had been considered.—Mr. LYLE urged that voluntary hospitals and Poor-law infirmaries should be represented. Dr. ADDISON'S suggested constitution appeared to him to be unsound.—After some discussion the proposed constitution moved by Sir KINGSLEY WOOD was agreed to.

Colonel WEDGWOOD moved to amend Clause 5 which deals with the election of direct representatives. He suggested that there should be proportional representation, and he asked that the Clause should be amended so as to read—"An election of the direct representatives of the nurses shall be by ballot by means of voting papers to be transmitted through the post in accordance with directions framed by the Council and approved by the Privy Council, and the directions shall contain all things necessary preliminary or incidental to an election, and every nurse for the time being registered on a register shall be entitled to give one vote, and such vote shall be transferable in accordance with such directions." It was suggested that the matter might be left over till the report stage was reached in order that a workable scheme might be evolved, but on a division Colonel WEDGWOOD'S amendment was agreed to by 12 votes to 9.

The Standing Committee of the House of Commons completed the consideration of the Nurses' Registration Bill on Monday, April 14th. Mr. DONALD MACMASTER was in the chair.

Mr. L. LYLE moved an amendment to Clause 16, which deals with the nurses' register, adding words to provide for a supplementary register of children's nurses. The work of the children's nurse, he said, was especially necessary at the present time, and in order that it might be done well steps ought to be taken to see that the best type of women were engaged in it. Under the Bill as drafted those women who devoted their lives to nursing children had no protection whatever.—Colonel BURN, in supporting the amendment, suggested that some very distinct rules ought to be laid down enabling the public to recognise the children's nurse, so that they would not be deceived by anyone masquerading in uniform.—Captain BARNETT thought that the object aimed at by Mr. LYLE would be achieved by the acceptance of an amendment standing in the name of Lieutenant-Colonel RAW, which provided for a supplementary register of nurses trained in nursing sick children.—Mr. LYLE assented to this suggestion, and his amendment was withdrawn in favour of that standing in the name of Colonel RAW.

Lieutenant-Colonel RAW, in moving his amendment, explained that it only referred to nurses who had undergone three years' training in a recognised children's hospital. Generally speaking, he was not in favour of supplementary registers, but he thought that this was a special case. Unless an amendment of this kind was carried the effect would be that a great many sick children's hospitals would be unable to get nurses to carry on the work. The amendment was agreed to.

Sir WATSON CHEYNE moved an amendment to provide for a supplementary register of fever nurses, who had been trained for three years in recognised fever hospitals and who held certificates of the Fever Nurses' Association, or their equivalent.—Sir KINGSLEY WOOD suggested that this matter was one which the Government might consider before the Report stage.—Sir WATSON CHEYNE withdrew his amendment on this understanding.

On the question that Clause 16 stand part of the Bill, Sir WATSON CHEYNE drew attention to the need for the organisation of village nurses. In outlying districts, particularly in Scotland, there was great need for fully trained nurses, but they would never be able to afford them. It was very desirable that some means should be taken to organise the village nurses, and see that they received a certain amount of training.—Clause 16 as amended was agreed to.

Sir KINGSLEY WOOD, in the absence of Dr. ADDISON (President of the Local Government Board), moved an amendment to Clause 17 restricting the fees for examination and registration. As finally agreed to the amendment provided that the fee should not exceed the sum of 1 guinea for registration within 12 months of the Bill becoming law, or 2 guineas afterwards, or 3 guineas for examination and registration.

A further amendment was carried providing that there shall be payable on or before Jan. 31st in each year by every registered nurse a fee of 6*d*., and in default the name may be removed from the Register, but may be restored on payment of a fee not exceeding 1*s*., and on proof that the failure was due to inadvertence or mistake.

Clause 17 as amended was agreed to, and the Bill as amended was ordered to be reported to the House.

Prevention of Anthrax Bill.

Sir H. GREENWOOD (Under Secretary at the Home Office) introduced in the House of Commons on Monday, April 14th, a Bill "to control the importation of goods infected or likely to be infected with anthrax, and to provide for the disinfection of any such goods." It was read a first time.

HOUSE OF COMMONS.

THURSDAY, APRIL 10TH.

Salaries of Health Visitors.

Sir HENRY HARRIS asked the President of the Local Government Board whether he proposed to issue an Order prescribing the qualifications and salaries of health visitors; and, if so, whether he was willing to receive suggestions on the subject.—Dr. ADDISON replied: I have the subject of training qualifications and duties of health visitors now under consideration, and though my honourable friend will no doubt assume that I have competent advisers I shall, of course, be happy to receive suggestions from him. I may add that I have already invited suggestions from a number of representative persons.

Notification of Venereal Disease.

Mr. CAIRNS asked the President of the Local Government Board if he was aware of a hospital in the North of England which had, in 1917, 2688 venereal cases for treatment, and in 1918, 2371 cases; and can he make an order for the notification of such cases or incorporate in the Health Bill some powers to enforce such notification.—Dr. ADDISON replied: The answer to the first part of the question is in the

affirmative. In reply to the latter part of the question I would refer the honourable Member to the statement made in the House yesterday by my honourable friend the Parliamentary Secretary.

Release of Temporary Medical Officers.

Major Sir BERTRAM FALLE asked the Secretary for War if temporary officers, Royal Army Medical Corps, who signed a contract with the War Office last May for 12 months' service (in Russia or elsewhere) would be allowed to return to this country at the expiration of the year contracted for and resume their civil practice.—Captain GUEST (Joint Secretary to the Treasury) replied: Yes, sir, provided transport facilities are available. It would not be possible at present.

Treatment of Pauper Lunatics.

Mr. IRVING asked the President of the Local Government Board if he had received a resolution passed by the Burnley Borough Council to the effect that the council supported the following resolution passed at a special meeting of the Lancashire Asylums Board on Jan. 13th, 1919, advocating an alteration of the existing method of dealing with cases of incipient insanity, that neither the words "lunatic" nor "pauper lunatic" should any longer be used, that the Poor-law connexion with pauper lunatics should be discontinued, that local authorities should be empowered to set up psychiatric hospitals wherein patients could be treated for mental disease without being certified and suggesting that the introduction of the Ministry of Health Bill afforded an opportunity of carrying out these suggestions, and whether he would favourably consider taking action in the direction recommended?—Dr. ADDISON replied: I have received a copy of the resolution referred to, and as I stated in reply to a question on the same subject on Feb. 27th last the whole matter will be reviewed with cognate questions in connexion with the establishment of the Ministry of Health.

District Nursing Associations and Public Health.

Captain AINSWORTH asked the President of the Local Government Board whether in any scheme for the control or provision of matters pertaining to public health the district nursing associations in Lancashire and Cheshire could be utilised by some method of coördination with the State or municipal authorities so that the valuable work done may not be overlooked?—Dr. ADDISON replied: I am well aware of the valuable work done by district nurses throughout the country, and that several district nursing associations in Lancashire and Cheshire are already coöperating with the local authorities in providing midwifery and nursing services. The Local Government Board continue to encourage such coöperation.

Medical Diary for the ensuing Week.

SOCIETIES.

ROYAL SOCIETY OF MEDICINE, 1, Wimpole-street, W.1.

MEETINGS OF SECTIONS.

Friday, April 25th.

STUDY OF DISEASE IN CHILDREN (Hon. Secretaries—G. B. C. Pritchard, H. C. Cameron, C. P. Lapage): at 4.30 P.M.
Case:
Mr. Warwick James: Multiple Epulides.
Notes on a Case of Aplastic Anæmia by Dr. J. Porter Parkinson.

ELECTRO-THERAPEUTICS (Hon. Secretaries—Robert Knox, Walter J. Turrell): at 8.30 P.M.
Paper:
Dr. James Metcalfe: Fractures of the Femur (illustrated by stereographs).
Discussion:
On "The Radiography of Gall Stones."
It is hoped that members interested will take part in the discussion and send in their names at once to the Hon. Secretaries, and that they will also show lantern slides, skiagrams, or radiographs bearing on the subject.

The Royal Society of Medicine keeps open house for medical officers of all the Allied Forces, and invites them to make free use of its library and rooms. The Emergency Post Graduate Scheme, under the charge of the "Fellowship of Medicine," is also open to all medical officers. Particulars of this will be supplied by the Secretary, Fellowship of Medicine, 1, Wimpole-street, London, W.1.

LECTURES, ADDRESSES, DEMONSTRATIONS, &c.

ROYAL COLLEGE OF SURGEONS OF ENGLAND, in the Theatre of the College, Lincoln's Inn Fields, W.C.
FRIDAY, April 25th.—5 P.M., Museum Demonstration:—Prof. A. Keith: Gunshot Injuries of the Skull and their Sequelæ.

LONDON HOSPITAL MEDICAL COLLEGE.
A Special Course of Instruction in the Surgical Dyspepsias will be given at the Hospital by Mr. A. J. Walton. Lectures, given in the Clinical Theatre:—
FRIDAY, April 25th.—10 A.M., Lecture XIII.:—Ætiology and Pathology of Carcinoma and Sarcoma of the Stomach.

Vacancies.

For further information refer to the advertisement columns.

Bedford County Hospital.—H.P. £150.
Bombay, Municipal Corporation of the City of.—Exec. Health Officer. Rs. 1500 to Rs. 2000 monthly.
Bradford City.—Bacteriologist. £600.
Cambridgeshire County Council.—Asst. Tuberc. Officer. £550.
Central London Ophthalmic Hospital, Judd-street, St. Pancras.—H.S. £50.
Croydon County Borough.—Female M.O. for Maternity and Child Welfare. £400.
Deptford Metropolitan Borough.—Female Asst. M.O.H. £400.
Dorset County Asylum, near Dorchester.—Second Asst. M.O. £300.
East Riding Lunatic Asylum, Beverley.—Med. Supt. £900.
Edinburgh, Royal Asylum, Morningside.—Temp. Asst. P. £365.
Falkland Islands.—Colonial S. £400. Also Colonial Dent. S. £400.
Great Northern Central Hospital, Holloway, London, N.—Cas. O. £200.
Guildford, Royal Surrey County Hospital.—H.S.
Jarrow Borough.—M.O.H. £750.
Keighley Borough Education Committee.—Female Asst. M.O. £350.
Leeds City.—Female Med. Asst. £400.
Leeds City Hospitals for Infectious Diseases and Tuberculosis, Seacroft.—Jun. Asst. M.O. £300.
Maidstone, Kent County Ophthalmic Hospital.—Locum Tenens. £5 5s. per week.
Manchester Education Committee.—Asst. Sch. M.O.'s (Male and Female). £450.
Manchester Royal Infirmary, Central Branch, Roby-street.—Res. Surg. O. £200.
Margate, Royal Sea Bathing Hospital for Surgical Tuberculosis.—Res. Surg. £200.
Melbourne, Australia, Walter and Eliza Hall Institute of Research in Pathology and Medicine.—Med. Research Director. £1000. Also First Asst. £600.
Middlesex Education Committee.—Temp. Asst. School M.O. £400.
Nazareth, Palestine, Medical Mission Hospital.—Locum. £400.
Newcastle-on-Tyne, Hospital for Sick Children. Res. M.O. £250.
Nottingham General Hospital.—Cas. H.S. £250
Nottingham and Midland Eye Infirmary.—Female Res. H.S. £200–£250.
Queen's Hospital for Children, Hackney-road, Bethnal Green, E.—Hon. Surg. to Ear, Nose, and Throat Dept.
Rotherham Hospital.—Jun. H.S. £150.
Royal Dental Hospital of London, Leicester-square, W.C.—Clin. Assts. One guinea per session. Also Two Demonstrators of Operative Dent. Surg. £150 and £125.
Royal Free Hospital, Gray's Inn-road, W.C.—Curator of Museum. £150. Also Res. M.O. £200.
St. George's Hospital, S.W.—Two Res. M.O.'s.
St. Mark's Hospital for Cancer, Fistula, and other Diseases of the Rectum, City-road, E.C.—Hon. P.
St. Peter's Hospital, Henrietta-street, Covent Garden, W.C.—Asst. S.
Salford, Ladywell Sanatorium for Infectious Diseases and Tuberculosis.—Asst. R.M.O. £200–£300.
Salford Royal Hospital.—Two Hon. Asst. P.'s, Hon. Asst. S., Hon. Oph. S., and Hon. S. for Diseases of Ear, Nose, and Throat. Also Pathologist. £300.
Scottish Women's Hospitals, N.U.W.S.S.—Female Asst. M.O. £300.
Sheffield, East End Branch of the Children's Hospital.—H.S. £150.
Sheffield Royal Infirmary.—Res. S.O. £200.
Sheffield University.—Demonstrator in Anatomy. £350. Also Two Demonstrators in Pathology and Bacteriology. £400 and £300.
Southampton, Free Eye Hospital.—H.S. £150.
South London Hospital for Women, South Side, Clapham Common, S.W.—Female H.P. £100.
Swansea General Hospital.—H.P. £250.
University of London.—University Chair of Anatomy (Royal Free Hospital) School of Medicine for Women. £600. Also University Chair of Anatomy at Guy's Hospital Medical School. £600.
Walsall General Hospital.—Female H.S. and Anæsth. £175.
Warford, Alderley Edge, Cheshire, David Lewis Epileptic Colony.—Asst. Director. £400.
West Riding County Council.—Sch. Med. Inspectors. £400. Also Sch. Oculist. £450.

THE Chief Inspector of Factories, Home Office, S.W., gives notice of vacancies for Certifying Surgeons under the Factory and Workshop Acts at Barrowden, Rutland; Dursley, Gloucester; Longton, Lancaster; Mold, Flint.

Births, Marriages, and Deaths.

BIRTHS.

CAPON.—On April 11th, at Cambridge-street, Hyde Park, W., the wife of Captain H. Vawdrey Capon, R.A.M.C., of a daughter.
DOUGLAS-MORRIS.—On April 11th, at The Gables, Stockcross, Newbury, the wife of Captain Douglas-Morris, R.A.M.C., of a son.

MARRIAGES.

CLYDE—ROBERTS.—On March 1st, at Bareilly Church, India, Captain David Clyde, R.A.M.C., of Airdrie, Scotland, to Phyllis Gertrude, daughter of Mr. and Mrs. W. H. Roberts, of Kent House, Birchington, Kent.

DEATHS.

BATEMAN.—On April 9th, after a short illness, Alfred George Bateman, M.B., Secretary of the Medical Defence Union.
BATTERSBY.—On April 8th, at Knock-na-Moe, Omagh, Co. Tyrone, Lieutenant-Colonel J. Battersby, J.P., late R.A.M.C.
BLACK.—On April 9th, at St. Thomas's Hospital, Guy Black, M.B., M.R.C.S., L.R.C.P., aged 42.
SHETTLE.—On April 9th, at Grosvenor-square, Southampton, Harry Wynter Shettle, M.R.C.S., L.R.C.P., aged 63.

N.B.—A fee of 5s. is charged for the insertion of Notices of Births, Marriages, and Deaths.

Medical News.

UNIVERSITY OF LONDON.—At examinations held recently the following candidates were successful:—

SECOND EXAMINATION FOR MEDICAL DEGREES.

Part II.—Janet Kerr Aitken, Ruth Mildred Arkwright, and Helen Rosaline Ashton, Lond. Sch. of Med. for Women; Henry Eric Beasley, Univ. Coll.; Mary Hilda Youle Blakeston, Rosalind Bradley, Lorna Phœbe Brown, Margaret Minna Brownstone, Edith Kathleen Budden, and Jean Elizabeth Callander, Lond. Sch. of Med. for Women; Frederick Cecil Wray Capps, St. Bart.'s Hosp; Linda Catmur, Lond. Sch. of Med. for Women; James Charles Churcher, St. Thomas's Hosp.; Joseph Alfred Cohen, King's Coll.; Gwendolen Coode Cotton and Catherine Agnes Cowan, Lond. Sch. of Med. for Women; Sidney Davies, Univ. Coll., Cardiff; Bernard Delchowsky, King's Coll.; *Edward Charles Dodds, Middlesex Hosp.; Kenneth Henry Doouss, St. Bart.'s Hosp.; Doris Kathleen Emery, Lond. Sch. of Med. for Women; Geoffrey Edward Woollcombe Felce, Guy's Hosp.; Vivian Feldman, Univ. Coll.; Ena Dorothy Foster, Lond. Sch. of Med. for Women; Arthur John Gardham, Univ. Coll.; Hilda Margaret Garlick and Geraldine Nora Geary, Lond. Sch. of Med. for Women; Dorothy Gibson, Cambridge Univ.; Kate Glyn-Jones, London Hosp.; Marjory Annie Godfrey, Marie Louise Pauline Goetze, and Alice Muriel Felicité Goldmann, Lond. Sch. of Med. for Women; *John Fereday Hackwood, St. Thomas's Hosp.; Doris Mary Hammond, Lond. Sch. of Med. for Women; Margaret Olwen Howell, Univ. Coll., Cardiff, and Lond. Sch. of Med. for Women; Fred Cecil Hunt, London Hosp.; Lily Graham Iliff and Erna Henrietta Jebens, Lond. Sch. of Med. for Women; Leslie Middlemiss Jennings, St. Bart.'s Hosp.; Eva Mary Johnson and Lorna Susan King, Lond. Sch. of Med. for Women; Alfred Thomas Lock Kingdon, Univ. Coll.; David Krestin and Henry Dillon Lawson, London Hosp.; Charles Gordon Lewis, Univ. Coll.; William Ernest Lloyd and David Martyn Lloyd-Jones, St. Bart.'s Hosp.; Alison Nicol Macbeth, Univ. Coll.; Caroline Gordon Lennox McHardy, Muriel Mackintosh, and *‡Phyllis Margaret Manson, Lond. Sch. of Med. for Women; Maurice Melgiave, B.Sc., King's Coll.; George Gliddon Michell, Univ. Coll.; Enid Marjorie Moore, Lond. Sch. of Med. for Women; Andrew John Morland, Univ. Coll.; George Joseph Victor Nelken, St. Bart.'s Hosp.; Enid Mary Powell, Univ. College, Cardiff; Gwendolen Mary Pratt and Elaine Margaret Katharine Salmond, Lond. Sch. of Med. for Women; Effie Frederike Amelia Samter, Victoria Univ. of Manchester; Ena Mildred Sansom and †Eileen Margaret Saxton, Lond. Sch. of Med. for Women; Frank Paul Schofield, St. Bart.'s Hosp.; William Skelly, Guy's Hosp.; George John Sophianopoulos, St. Bart.'s Hosp.; Eleanor Charlotte Emma Stone and Emma Marjorie Store, B.Sc., Lond. Sch. of Med. for Women; Muriel Amy Sutton, B.Sc., Univ. Coll.; Eric Waldo Caryl Thomas, St. Bart.'s Hosp.; Howard Metherell Toop, London Hosp.; Hygeia Leigh Josephine Wallace, Lond. Sch. of Med. for Women and King's Coll.; Robert Arthur Walsh, St. Bart.'s Hosp.; Hilda Margaret Whitfield, Lond. Sch. of Med. for Women; ‡Charles Paul Wilson, Middlesex Hospital; and Harriette Barbara Woodhouse and Eva Young, Lond. Sch. of Med. for Women.

* Distinguished in Physiology. † Distinguished in Pharmacology.
‡ Distinguished in Anatomy.

ROYAL COLLEGE OF PHYSICIANS OF LONDON.—An ordinary Comitia of the Royal College of Physicians of London was held on April 14th, Dr. Norman Moore, the President, being in the chair.—After some formal business, the President delivered his annual address. He referred to the various honours and decorations conferred upon Fellows, Members, and Licentiates during the past year, and mentioned that in this, the 401st year of the College its roll consisted of 368 Fellows, 492 Members, and 13,645 Licentiates compared with 6 Fellows at the time of its foundation in 1518. He referred to the work of the College and of its committees during the year, with special reference to the Committee of Reference and the Joint Committee on the proposed Ministry of Health. He then read obituary addresses on the 18 Fellows who had died during the past year—namely, Dr. Alfred Ellington Stansfeld, Sir Herman Weber, Dr. Edward Liveing, Dr. Frederick Thomas Roberts, Dr. Richard Grainger Hebb, Dr. George Ogilvie, Dr. Robert Liveing, Dr. Edward Thomas Wilson, Dr. William Vicary Snow, Sir James Sawyer, Dr. Robert Saundby, Dr. Alfred Henry Carter, Dr. John Michell Clarke, Dr. William Barnett Warrington, Dr. William Allen Sturge, M.V.O., Dr. Thomas Buzzard, Dr. Frederick Eustace Batten, and Dr. Leonard George Guthrie.—The thanks of the College were accorded to the President for his address, and he was asked to allow it to be printed.—Dr. Norman Moore was re-elected President for the ensuing year.—Sir Wilmot P. Herringham proposed and Sir William Hale White seconded the following resolution, which was carried:—

The Royal College of Physicians of London in full meeting hereby records its opinion that the passing into law of the Dogs Protection Bill now before the House of Commons will greatly retard the progress of our knowledge with regard to the prevention and treatment of disease.

The President then dissolved the Comitia.

ROYAL COLLEGE OF SURGEONS OF ENGLAND.—A quarterly meeting of the Council was held on April 10th, Sir George Makins, the President, being in the chair.—It was resolved to issue diplomas of Membership to three successful candidates, and a diploma of Fellowship to one successful candidate.—The thanks of the Council were given to Mr. Stephen Paget for presenting to the College the microscope used by his father, Sir James Paget, for his work on surgical pathology.—The Jacksonian prize for the year 1918 was awarded to Mr. F. A. Cairns Forsythe, F.R.C.S., for his dissertation on "Injuries and Diseases of the Pancreas and their Surgical Treatment." Mr. Cairns Forsythe was requested to attend at the ordinary meeting of the Council on May 8th to receive the Jacksonian prize.—It was resolved that the subject for the Jacksonian prize for the year 1920 should be "The Results and Treatment of Gunshot Injuries of the Blood-vessels."—The Triennial Prize Committee reported that no essay had been received on "The Development of the Hip-joint and Knee-joint of Man." It was resolved that the subject for the next prize should be "The Anatomy, Morphology, and Age Changes of Cervical Ribs in Man, including a Description of the Associated Ligaments, Muscles, Blood-vessels, and Nerves."—Two Members of 20 years' standing were elected Fellows of the College—Professor J. G. Adami, Colonel, C.A.M.C., and Sir John Goodwin, K.C.B., C.M.G., D.S.O., Director-General, Army Medical Service.—Sir Charles Ballance was elected the representative of the College on the Senate of the University of London for four years.—The President reported that Professor T. B. Layton's postponed Hunterian lecture on "Surgical Aspects of the Collection and Transport of Wounded" will be delivered at 5 P.M. on Tuesday, May 6th.—The Council resolved that an examination in general anatomy and physiology and general pathology and surgery, Part I. of the Second Professional Examination for the Licence in Dental Surgery, shall be held in July in addition to the examinations in May and November, and that candidates who fail to pass the examination in May shall be allowed to present themselves for re-examination in July.—The Council authorised the chairman of the Board of Examiners in Dental Surgery to make certain concessions to dental students who have served with His Majesty's Forces.—A report was read from Dr. W. S. A. Griffith on the proceedings of the Central Midwives Board during the year 1918. The thanks of the Council were given to Dr. Griffith for his report, and it was entered on the minutes.—Mr. E. W. Hey Groves was appointed a delegate from the College to the annual session of the American Medical Association in Atlantic City, New Jersey, U.S.A., in June next, and the Convention of the Ontario Medical Association at Toronto, in May.—A letter was read from the Barbers' Company reporting that at a recent court of the company it was resolved that the company should offer the annual sum of 10 guineas for five years for the purpose of instituting at the Royal College of Surgeons an historical lecture in anatomy or surgery, to be called the Thomas Vicary lecture, the appointment of the lecturer being in the gift of the College. The offer was accepted with thanks.—The President reported that the term of office of Sir Charles Ballance on the Court of Examiners would expire in May, and that the vacancy thus occasioned would be filled at the ordinary Council on May 8th.

LITERARY INTELLIGENCE.—Messrs. A. and C. Black announce the issue of a new volume in the Edinburgh Medical Series on Cerebro-spinal Fever, its Etiology, Symptomatology, Diagnosis, and Treatment of Epidemic Cerebro-spinal Meningitis, by Dr. Cecil Worster-Drought, Captain (Temp.) R.A.M.C., and Dr. Alex. Mills Kennedy, late Captain, R.A.M.C. The outbreak of this disease in England in 1915, and the methods adopted in the Army to combat it, afforded the authors exceptional opportunities for the investigation of cerebro-spinal fever, and the volume includes observations extending over a period of more than three years.

THE MINISTRY OF HEALTH BILL: ACTION IN BELFAST.—At a very largely attended meeting of the medical profession of Belfast, held in the Medical Institute on Wednesday evening, April 9th, the following resolution was passed unanimously:—

That the medical profession in Belfast regret that no opportunity was found for the profession in Ireland to place their views before the Government, and that no organisation representative of Irish medical opinion was consulted prior to the drafting of the Irish clauses in the Ministry of Health Bill. They object to the constitution of the Irish Public Health Council to be established under the Bill, the object of which is to give advice and assistance and to make proposals to the Chief Secretary in connexion with his powers and duties under the Act—first, because there is not sufficient representation of the medical profession on the council, and, second, because those to be appointed must be nominated by the Chief Secretary, thus denying to the medical profession the right to select their own representatives, a democratic principle conceded by the precedent established in the Central Midwives (Ireland) Act of 1918. The medical profession in Belfast believe that unless all parts of Ireland are adequately represented in this Advisory Health Council it will become a mere centralised body largely composed of officials and carrying little weight or influence.

It was further resolved that the Chief Secretary (Mr. Ian Macpherson), who is coming to Belfast on April 29th with the Irish Attorney-General and Sir Henry Robinson (vice-chairman of the Local Government Board), be asked to

receive a deputation of medical men on this forthcoming visit. At the same meeting a local medical committee for 1919–20 was appointed; five delegates were selected to a meeting of the profession to be held in Dublin and instructed as to their attitude towards matters in a provisional agenda, which was discussed.

SMALL-POX IN LONDON.—As there have been two outbreaks of small-pox in London during the past 12 months, and as many cases have remained undiscovered for a considerable time after the first appearance of the disease, the London County Council is publishing the arrangements under which in doubtful cases the certifying practitioner confers with the medical officer of health of the borough. Special attention is drawn to the fact that, should a further opinion be required, on application to the Public Health Department, No. 2, Savoy-hill, W.C.2 (Tel. No. Gerrard 3641), the services of Dr. W. McConnel Wanklyn will be available. In similar circumstances Dr. J. A. H. Brincker's services will be available as at present for the purpose of making any necessary lumbar punctures in suspected cases of cerebro-spinal fever, poliomyelitis, and encephalitis lethargica. Further, in view of the recent order of the Local Government Board requiring the notification of dysentery, trench fever, and malaria contracted in this country, it is mentioned that, pending any further directions in the matter, facilities will be afforded for examination of any material which may be submitted for pathological investigation.

KING EDWARD VII. SANATORIUM, MIDHURST.—The twelfth annual report (July, 1917–July, 1918) announces the resignation of Sir Frederick Treves, the chairman of the council, who has been connected with the institution since its opening in 1906. The resignation of Dr. N. Bardswell, the medical superintendent, is also announced, but it is added that his connexion with the statistical work of the sanatorium will be continued. The sanatorium has recently been equipped with a dental department, as it was found that the mouths of many of the patients were in a neglected condition which interfered with their general treatment. The report of the throat department shows that of the 471 patients with laryngeal tuberculosis discharged since 1906, 310 are dead, 155 are still alive, and 6 have not been traced. Of the 14 who served with H.M. forces in spite of laryngeal disease, 7 are still serving and 7 have been invalided out. Altogether 126 ex-patients have served in H.M. forces and 75 have remained well. One point of interest elicited by statistical observation is the prognostic significance of the disappearance of tubercle bacilli from the sputum during the patient's residence in the sanatorium. It has also been found that the disappearance of tubercle bacilli usually occurs within the first 12 weeks of treatment. If present after this interval they will probably still be demonstrable three months later. The report supports the findings of earlier years as to the limitations of tuberculin treatment.

DEATH OF DR. BRANSBY ROBERTS.—The death occurred recently at Eastbourne, where he had resided for over half a century, of Bransby Roberts, M.D. St. And., M.K.Q.C.P., M.R.C.S. Eng., L.S.A. Lond. (retired), who at one time was one of the best known medical practitioners in Sussex. Born in Finsbury-circus, London, in 1830, he was educated at St. Paul's School and Guy's Hospital, taking the M.R.C.S. degree and L.S.A. diploma in 1853. For a short time he was resident house surgeon at the London Ophthalmic Hospital, but the Crimean War breaking out he proceeded thither and was assistant surgeon at Renkioi Hospital, Dardanelles, and was in camp before Sevastopol three days before its fall. After the war he settled at Eastbourne and acquired an extensive practice. In 1867 he took the licence of the King and Queen's College, Ireland, becoming a member in 1883, and proceeded to the M.D. degree St. Andrews in 1876. He took a keen interest in any movement for the well-being of Eastbourne, was for many years consulting physician at the Princess Alice Memorial Hospital, was a considerable traveller, and was the founder and first president of the local Natural History Society.

QUEEN ALEXANDRA'S HOSPITAL FOR OFFICERS, HIGHGATE, N.—On March 20th an entertainment was given to the patients and nursing staff at this hospital to celebrate the fourth anniversary of the opening of the institution. Sir Alfred Mond, the chairman, who presided, presented the matron and each member of the staff with a wrist watch. Major Ian Anderson, the senior officer in the hospital, thanked Sir Alfred Mond, to whom the hospital, he said, owed much. The building, which was commenced in December, 1914, was completed by February of the following year, and was accepted by the Army Council in the succeeding March. Consisting originally of 26 beds, the accommodation was subsequently increased by seven beds. The S. J. Waring Annexe in Portland-place was opened in 1917 and the Lady Mond Annexe at Machet-court was also added. These annexes brought up the total of available beds to 57 and they have always been fully occupied. The experience of four years has demonstrated the fact that treatment under the conditions of the salubrious air of Highgate has diminished the duration of hospital treatment by some 30 days in 100. The report also states that the fresh air of Highgate had an influence on the condition of patients after the administration of an anæsthetic. "There is a slighter rise of temperature, and greater freedom from bronchial irritation as compared with the effects of similar anæsthetics administered in a London hospital. This is especially the case with regard to nitrous oxide gas and oxygen, which during the past three years has been employed extensively by one of our honorary anæsthetists." The statistics of the work done during the four years ending March 20th, 1919, show that 839 officers were admitted and 794 discharged. There were 581 operations, 855 X ray examinations, and 8 deaths. The mortality-rate of all cases was 9 per cent., and the mortality-rate of operation cases 3 per cent. Of the officers discharged 437 returned to duty (of whom 35 subsequently were killed in action or died of wounds), 88 are still unfit, and 32 have relinquished their commissions on account of ill-health.

SCOTTISH BOARD OF HEALTH BILL.—A meeting of the medical profession in Edinburgh and Leith was held on April 8th to consider questions concerning this Bill. The meeting was largely attended, and the two following resolutions were passed unanimously:—

That even if it involves an addition to the membership of the Board there should be two members representing the clinical side of medicine.

Having now considered the Bill of the Scottish Board of Health this meeting of the medical profession of Edinburgh and Leith are strengthened in their conviction of the necessity for the establishment of a Standing Medical Consultative Council, the members of which should be elected directly by the profession, and should have powers to discuss and make representations to the Board on any matters which in their opinion affects, directly or indirectly, the health of the community. And this Council should have power to meet jointly with any council, medical or lay, as occasion arises. This Council should consist of at least 11 members, one of whom should be a registered dentist with a medical qualification.

THE LATE MR. H. W. SHETTLE.—Harry Wynter Shettle, M.R.C.S. Eng., L.R.C.P. Edin., who died at Southampton on April 9th, was a son of T. W. Shettle, of Wimborne. Born in 1854, he was educated at Sherborne, where he was a member of the school cricket eleven. Coming up to St. George's Hospital he continued his athletic performances by winning the high jump at the United Hospitals sports and was at the same time a prominent footballer. He qualified M.R.C.S. Eng., L.R.C.P. Edin. in 1880 and went as house surgeon to the Royal South Hants Infirmary; after leaving this post he settled in practice at Southampton and became surgeon to the Royal South Hants Infirmary. Mr. Shettle held a commission in the R.A.M.C. (T.F.) as lieutenant-colonel, and had been working during the war at the Red Cross Hospital at Highfield Hall, Southampton. He was an ex-President of the Southampton Medical Society, and in former days had been a member of the Dorset county cricket eleven.

Communications, Letters, &c., to the Editor have been received from—

A.—Col. J. G. Adami, A.D.M.S.; Dr. H. G. Adamson, Lond.

B.—Dr. W. Brown, Lond.; Sir John Rose Bradford, K.C.M.G., C.B.; Dr. M. Benaroya, Paris; British Red Cross and Order of St. John, Joint Finance Committee, Chairman of; Major-Gen. Sir David Bruce, K.C.B.; Dr. J. Blomfield, O.B.E., Lond.; Mr. F. A. Bath, Bournemouth; Lieut. W. G. Burt, R.N.; Board of Education, Lond.

C.—Mr. H. Coleman, Lond.; Mr. E. M. Corner, Lond.; Mr. S. Coltson, Lond.; Mr. J. Cabburn, Lond.; Mr. J. C. Carr, Liverpool.

D.—Mr. E. Doherty, Lond.

F.—Dr. J. G. Forbes, Redhill.

G.—Messrs. George Goodman, Ltd., Birmingham; Capt. J. K. Gaunt, R.A.M.C.; Dr. M. Garnier, Paris; Col. G. E. Gask, C.M.G., D.S.O., A.M.S.

H.—Dr. A. K. Henry, Dublin; Mr. E. Hindle, Ph.D., Cambridge; Mr. J. Henderson, Pietermaritzburg.

J.—Dr. R. W. Johnstone, Lond.

L.—Dr. W. J. Le Grand, Blackwell; Dr. C. E. Lakin, Lond.; Mr. C. M. Leakey, Gunnislake; Mr. J. Lewenstein, Hull; Dr. T. Lumsden, Lond.

M.—Dr. H. C. Miller, Lond.; Mr. J. Y. W. MacAlister, Lond.; Capt. W. M. Munby, R.A.M.C.(T.); Mr. P. A. McKay, Clydebank; Medical Society of London; Mr. J. S. Milne, Swalwell-on-Tyne.

N.—Dr. H. P. Newsholme, Trowbridge.

O.—Dr. S. A. Owen, Lond.

P.—Mr. F. H. Perrycoste, Polperro; Dr. G. R. Pirie, Lond.

R.—Royal Mail Steam Packet Co., Lond.; Royal College of Surgeons in Ireland, Dublin, Sec. of; Dr. W. C. Rivers, Barnsley; Royal Statistical Society, Lond.; Royal Medical Benevolent Fund, Lond.; Royal Institution, Lond.

S.—Dr. E. B. Sherlock, Lond; Dr. C. N. Slaney, Parkhurst; Mr. W. P. Stocks, Manchester; St. George's Hospital Medical School, Lond., Dean of; Prof. W. Stirling, Manchester; Dr. W. G. Spencer, Lond.; Dr. J. F. W. Silk, Lond.; Mr. P. Smith, Tredegar; Mr. R. B. Smith, Mutley.

T.—Dr. W. W. C. Topley, Lond.; Prof. E. H. Tweedy, Dublin; Sir Nestor Tirard, Lond.; Dr. L. Thatcher, Edinburgh; Capt. J. G. Thomson, R.A.M.C.

V.—Mr. T. Vivian-Rees, Cardiff; The Victim.

W.—Mr. J. P. Williams; Mr. J. St. G. Whitty, Weston-super-Mare; Capt. A. Watson, R.A.M.C.